605 v. 18 1337

INDEX TO ADVERTISERS AND CONTENTS ON PAGE 30.

THE FOUNDRY

VOL. 18 DETROIT, MICH., MARCH, 1901 No. 103.

PUBLISHED MONTHLY BY

THE FOUNDRY PUBLISHING CO.

DETROIT, MICH.

JOHN A. PENTON, - - - EDITOR.
HENRY HANSEN, - - ASSISTANT EDITOR.

SUBSCRIPTION PRICE:

$1.00 a year in advance, postage prepaid in the United States, Canada and Mexico.
$1.75 a year to other countries, postage prepaid.
Single Copies, 15 Cents.

ADVERTISING RATES ARE PRINTED IN EACH ISSUE

Space in advertising pages only is for sale.

Subscribers can have their mailing address changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.

To Foreign Subscribers we recommend the use of international postoffice money orders in sending remittances. These are both cheap and safe.

We want to obtain examples of current foundry practice. Photographs, drawings and descriptive matter, showing just what is being accomplished in the foundries of to-day, will be cheerfully paid for.

We can not furnish a continuous set of back numbers beyond September, 1900.

Entered at the Post Office at Detroit, Mich., as second-class matter.

ANNOUNCEMENT.

After March 1st, 1901, the publication office of THE FOUNDRY will be removed from Detroit, Mich., to Cleveland, Ohio.

A new Company known as THE IRON & STEEL PRESS COMPANY has been organized for the purpose of conducting a general publishing business, and to that end has purchased the two newspaper properties known respectively as THE IRON TRADE REVIEW, of Cleveland, Ohio, and THE FOUNDRY, of Detroit, Mich.

It is confidently believed that this arrangement will bring advantages and elements of strength to both papers, particularly THE FOUNDRY.

Speaking for THE FOUNDRY, the writer, who has been the Editor and sole Proprietor almost ever since the first issue, and who is responsible for the publication in more ways than one, is glad to be able to advise our many friends that it is expected by this arrangement to improve greatly the facilities now at our disposal for making THE FOUNDRY many times more valuable to both readers and advertisers than ever before.

Just by what means and how this is to be done is, of course, a matter of detail in which probably no one who reads this is interested. Results are what count, and we hope to be able, steadily from now on, to make even more conspicuous and marked than ever before, the high standard that made THE FOUNDRY a success from the first.

There will be no change in the management of THE FOUNDRY or its policy in any respect further than those which may be deemed necessary in the interests of our readers.

John A. Penton

Tech 5-5-

Trade Outlook.

Complaint is heard in some quarters as to a scarcity of orders carrying any great volume of work. There is no doubt that requirements for castings are doled out in a kind of hand-to-mouth fashion, but in the aggregate the amount of iron melted and the number of molders at work must be considered as more than a fair average.

It is but natural that we should compare the current volume of trade with the unprecedented activity of the past, and yet such comparison is neither just nor does it offer any base on which to estimate future requirements. It is doubtful if foundrymen as a class would take advantage of long-time contracts were these freely offered. The experience of 1899, when heavy time contracts had to be filled at low prices, while the shop without any such hindrance reaped the benefit of the advance, is likely for some time to come to make the founder satisfied to run chances of getting work when he needs it.

We quote the following from a recent comment of the market by Rogers, Brown & Co.:

"There has been an apparent steadying of the market, brought about, possibly, by the rumors of consolidation of the largest iron and steel interests in the country, and the impression is gaining ground that even a radical reduction in the price of lake ores will not enable furnaces to sell foundry iron at much less, if any, than present figures. Temporarily, at least, a halt has been called in the decline of price of Southern brands. The buying continues as it has for some months past. Orders, as a rule, are limited to early requirements, and there is considerable pressure to have shipments made promptly. The irregularity of prices, as before noted, continues, some producers being unwilling to accept offers at the low quotations made by others. The hopeful feeling continues that the tonnage for the year will be large, and the foundries throughout the country are noting in most cases a satisfactory increase in business."

Matthew, Addy & Co., in reviewing present conditions, say: "Unquestionably the market has a better tone. The improvement began with the purchases of Bessemer which inspired more confidence in buyers than they had before possessed. The result has been a much active demand and considerable purchasing. Not only are the small buyers decidedly in evidence, but a number of large lots have been bought, and as we write several wholesale blocks are under consideration. The requests for faster shipments on old orders are as pressing as ever. Melters of iron throughout the country are busy and there is a revival of trade in many directions that is conspicuous, notably in cast-iron pipe. It is an undisputed fact that all branches are busy and that the prospects ahead for an increase in activity are excellent. Iron masters both North and South are complaining that prices have been forced down now to a point where the margin of profit is too small for safety. There are still buyers of Southern iron who seem to feel that at present prices the Alabama and Tennessee iron masters have a bonanza. Could they see the cost sheets of the Southern iron companies they would speedily realize their mistake. Costs in the South advance precisely in the same ratio as costs in the North. Under these circumstances lower prices than those prevailing are not at all probable. In fact, the present active buying indicates firmer views on the part of sellers all around. All the recent developments are full of encouragement, and we look for a continuance of buying that will put the iron masters in an increasingly better position."

Foundry Fires.

One would naturally suppose that when anyone puts up a building for foundry purposes every precaution would be taken against damage from fire. But such is far from being the case.

When the price of iron was three times of what it is now there was some excuse for resorting to the use of wood. At the present time, when permanence, insurance and risk is considered, the iron building becomes the cheapest.

Many foundries build nice brick walls and then top them over with a flimsy roof which goes up in smoke every now and then and causes as much damage as if the whole building had been wood.

No one can tell when a mold will blow up and send some sparks to the roof, where their presence may not be noted until everyone has departed and it has a first-rate chance to get a good start.

Started from the cupola are words that stick out prominently in nearly every foundry fire, and judging from the way most cupola scaffolds are built, it is a wonder that

the cupola starts no more fires than it does.

Then there is the flask and bottom-board which smolders away until it calls the fire department about 11 o'clock in the evening. If the building was made fire-proof the burning of a few flasks would cause but little inconvenience.

While insurance may pay for the actual value of what the flames consume, no one can be reimbursed for the inconvenience and loss of trade which follows.

The Krank's Korner.

Some months ago I criticised the kind of advertising the majority of the foundries were doing. I believed then, and do so now, that foundries should toot their own horns more than they are doing. A foundry has just as much right to attract business through advertising as a merchant, and I never could see any reason why they should not receive the same return from a legitimate outlay in this direction as the latter.

* * * *

I am glad to note that one firm at least has got courage enough to talk about its own facilities. I do not know whether C. Gilbert & Son, of Albany, Mo., advertise regularly or not, but the man who wrote the following, which is printed on the back of their letter head, could write an advertisement that would draw customers. Of this I am certain. Here is the wording of the notice:

C. GILBERT & SON

IRON AND BRASS FOUNDERS AND MACHINISTS

Newly Equipped, New Cranes, New Machinery.

We have the only first-class equipped plant in N. W. Mo. We have both large and small cupolas for light and heavy work, of the latest designs. We have put in the latest improved cranes for handling all heavy work quickly, and tracks, cars and power sand sifters expedites our work greatly. We can make house fronts, iron stairways, etc., for less money than city foundries. 1st. We pay no rent. 2nd. Taxes are less. 3rd. The junior member of the firm is a practical and competent foundry foreman. 4th. The senior member of the firm has had many years experience in machine work and pattern making, and is a master mechanic. We have many patterns of house fronts, iron stairways, iron fencing, balcony railing, and roof cresting to select from. All our columns are turned true in a lathe at each end. We make grates, engine and saw mill castings of all kinds, and do all kinds of machine work. We guarantee all work, same to be of good material, and can furnish all common sized house fronts in about a week's notice. We have put in a new brass furnace, and can make brass castings in a few hours' notice at any time. We can save money for any one that needs iron work in our line. Plans and estimates cheerfully furnished.

TESTIMONIALS.

McFall, Mo., Nov. 15, 1899.

C. Gilbert & Son, Albany, Mo.:

Gentlemen—We are today unloading the iron we ordered of you November 8, and must say we are highly pleased not only with the iron but the prompt shipment you gave us. As your prices on the iron front was so much lower than Chillicothe, St. Joe, etc., we were uneasy for fear the job would be poor, and after inspecting same we do not hesitate to say they are the best set of irons in town and cost less money. In the future when we are needing structural iron, you may expect our order. Once more thanking you for prompt service and good work.

GROMER BROS.

Albany, Mo., March 12, 1900.

This is to certify that C. Gilbert & Son made and delivered to us promptly three iron fronts in 1899, all of which was done in a workmanlike manner and of good material. They are newly equipped with modern machinery and can turn out work promptly, and we do not hesitate to recommend them as prompt and efficient.

BARKLEY & COULTER,
Contractors and Builders.

* * * *

Who will say that this is not pretty good?

No rent, low taxes, junior member a competent foundry foreman, senior member a master mechanic. This is a combination which ought to succeed.

* * * *

Some time ago a friend of mine asked a question concerning the analysis of the best car wheel iron through a mechanical journal, and in reply received the following communication:

As for analysis of the iron used for the casting of mine car wheels, I really do not know it, but if practical experience will be of benefit to you, I can be of use to you, as I have spent two years and six months in the car wheel business, two years as a molder and the balance of the time on the cupola and in the super-

intending of the work done in the foundry.

I can tell you the different irons that are used in the mixture, and thoroughly understand the same. I am very anxious to get work to do, and can furnish the very best of references from the most prominent men in business here, and if the enclosed information is not sufficient, and you can use my experience to your advantage, please write me and give me a chance to work my way up in your concern. I have found a very good and really one of the best mixtures for the class of work you specify is as follows:

50 lbs. Allegheny, No. 5.
50 lbs. Salisbury, No. 3.
50 lbs. soft scrap.
3,050 lbs. old wheels, medium hardness.
12 lbs. Calder.
6 lbs. Irving.

You will find *that* a perfect mixture for that kind of work, and if it is melted right you cannot make a mistake. If, however, you find the chill coming high, you can safely reduce it by increasing the amount of Calder.

I hope that you can use my information, and can also find a place for me in your concern, and certainly I cannot only make the wheels you mention in your article, but can, without doubt, sell them as well.

* * * *

The trouble with this kind of information is that it does nobody much good. One thing which strikes me with particular force is the suspicion that the "Calder" and "Irving" brands of iron must be pretty powerful stuff, especially the latter, where six pounds controls the destiny of the 3,218 pounds in the mixture. One thing is sure, neither brand has much of a pedigree, as none of the Iron and Steel Directories have yet discovered either one.

* * * *

The following is from the American Manufacturer:

Hand labor is gradually being abolished in almost all lines of manufacture. A man who would have suggested that whole foundries could be operated by machinery would have been laughed at ten years ago. Foundrymen can to-day ram the sand, handle the patterns, and flasks, pour the metal, clean and paint the castings entirely by machinery, disposing of scores of workmen formerly required, and increase the output.

Pneumatic machinery is playing a part in modern foundry practice to a surprising extent. The workmen adapt themselves readily to changed conditions, and really enjoy a brighter existence under the new system. The main obstacle to a more rapid introduction of labor saving machinery is the first cost. Then there is the feeling of the conservative manufacturer who is willing to let well enough alone. These rarely awake from their self-satisfied position until their trade has been secured by a competitor. The first cost of labor saving machinery might frequently be made in the ability of the shop owner to secure one contract that he otherwise could not have secured if he had been satisfied to labor under the old and costlier method. Foundry work will be brought down to a more solid basis, and the hit and miss principle of securing good castings will be a thing of the past as improved machinery is adopted.

* * * *

The only thing which machinery cannot do is to do without the brains which direct its movements. No matter how much machinery is introduced to the foundry, there will always be a demand for people who know how to keep it in operation.

There is no hit or miss principle in securing good castings to-day. Castings of inferior quality are turned out in some shops, and strange enough a lot of these have the very best of equipments.

The manager who does not know how to turn out a good casting without machinery will not be able to do anything better after the latter is installed. The foundry can with benefit employ mechanical appliances, but competent foundrymen are of equal importance.

The E. P. Allis Foundry, Milwaukee, Wis.

The E. P. Allis Company, of Milwaukee, Wis., operates three foundries,—two at Milwaukee, Wis., and one at Buffalo, N. Y., having altogether what is believed to be the largest amount of floor space operated by one concern for foundry purposes. Besides they are compelled at times to buy large quantities of castings outside of their own works.

Their two foundries in Milwaukee are about the same size, the Reliance shop being 550 feet long by 120 feet wide, served by three electric travelling cranes of 35 tons capacity each, and having a clear lift of 25 feet. There are seven large drying ovens, the cars of which are operated by an endless sprocket chain. There are three cupolas, two of which are capable of melt-

ing about one hundred tons each at a heat, a smaller one of thirty tons capacity being reserved for the purpose of melting special iron for chilled rolls and other work.

The foundry is well lighted and ventilated, there being three 72-inch fans running at the rate of 250 revolutions per minute, in order to remove the obnoxious gases which may be generated while casting.

At the south end of the building is the cleaning room, with a railroad track through the center, where all the castings are delivered by the cranes, and after being cleaned are loaded on flat cars and transferred to different departments by the switching locomotive.

The Reliance foundry is reserved principally for loam work, as the South foundry of the Allis Company makes a specialty of green sand work, and runs about the same weight of heats as the Reliance shop. Some of our illustrations will show the class of work being done in the latter.

Fig. 1 gives a view of a couple of Corliss cylinders in the course of being molded at the Reliance shop. The one in the foreground is 96 inches in diameter, and weighs 32 tons; the one in the rear has a bore of 80 inches and weighs 25 tons. In sweeping up these cylinders they use a 6-inch spindle, which is stationary, the arms revolving upon collars attached by set screws.

Fig. 2 is a mold for a large "A" frame, weighing 22 tons when finished. This casting is bolted to the bed-plate and supports the cylinders. Fig. 3 shows in the foreground a portion of the mold for an 18-foot pulley with 50-inch face. In the rear are seen some smaller "A" frames under construction. To the left are the side floors used for green-sand work, and to the right will be noticed a small section of the core used in the mold shown in Fig. 2. This core in itself weighs 35 tons.

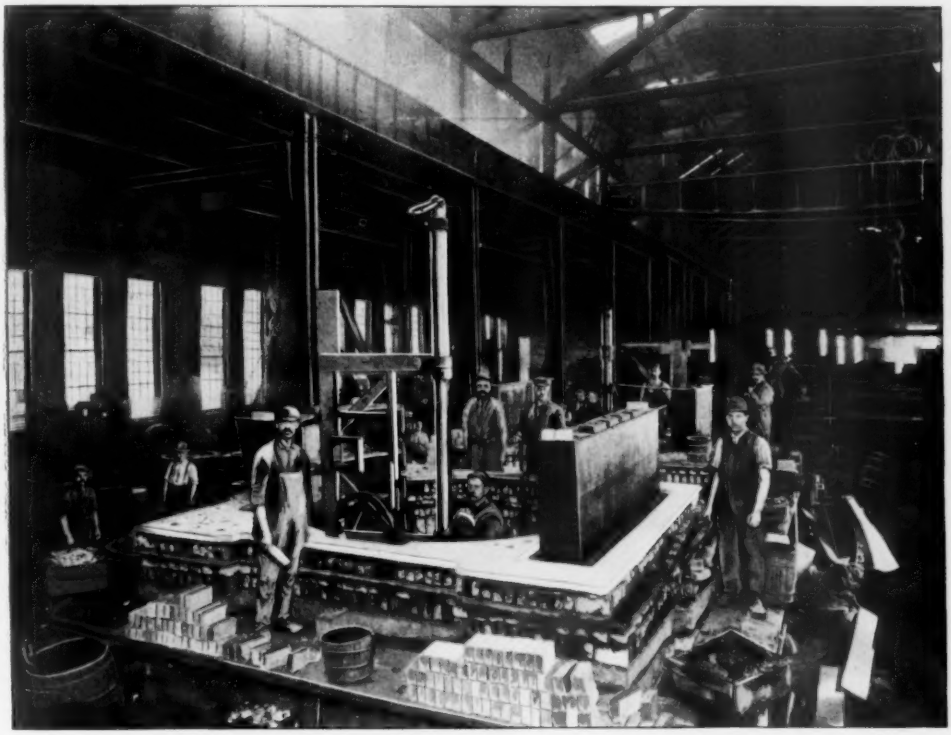


FIG. 1. CORLISS CYLINDERS IN COURSE OF CONSTRUCTION AT THE ALLIS FOUNDRY, MILWAUKEE.

Fig. 4 shows in the foreground the same mold as Fig. 3, but the general view of the shop is in an opposite direction, and includes the cupolas at the right. Fig. 5 gives an illustration of the casting of a 15-ton disc crank, being poured with two ladles. This mold is cast upon the floor level, it being rammed up inside of a sectional curbing, designed by Joseph Harrison, superintendent of the foundry department.

EDWARD B. GILMOUR.

Open-Hearth Steel Castings.

The advances that are being made in the steel casting industry are much more satisfactory than those attending any of the various developments of iron. Malleable cast iron has also progressed wonderfully; yet while the product has been brought up to a standard, the manufacturer is yet to be found who will guarantee his metal heat after heat, as is most necessary in the instance of steel. Steel is of course a strictly higher grade of metal than the others, from the fact that it will adapt itself to any condition attainable in them, besides meeting demands under which cast and malleable iron fail, or could not be expected to hold their own. Of the three varieties of steel castings, viz., Bessemer, open-hearth and crucible, the open-hearth has been proved the most serviceable for all classes of work, and for many reasons. Bessemer has incorporated in its composition during production, an element which precludes homogeneity, for not enough time lapses from the completion of a blow until pouring molds in which to allow some reagent the opportunity of working out the surplus oxygen. In open-hearth this undesirable quality does not develop, for during the progress of the heat in the furnace all of the excess oxygen both of fuel gas, and that arising from the chemical reaction in the metal, has become volatilized and thus passes off. A similar condition prevails during the manufacture of crucible steel.

The range of the steel casting is ever enlarging, and the question of the best general metal has been solved in the production of open-hearth. In electrical construction its peculiar adaptability has been demonstrated far beyond the ideas of early designers, and this great success has been attained in following out the many vantage points offered by a low carbon content. With the carbon high in steel the point of resistance has been very low, and a reverse condition is possible with low carbon. Specific gravity of the metal has much to do with these conditions, for in the denser metal of the higher carbons, the specific gravity will be found upon examination to be lower than in metal of low carbons, where the cystallization is large and

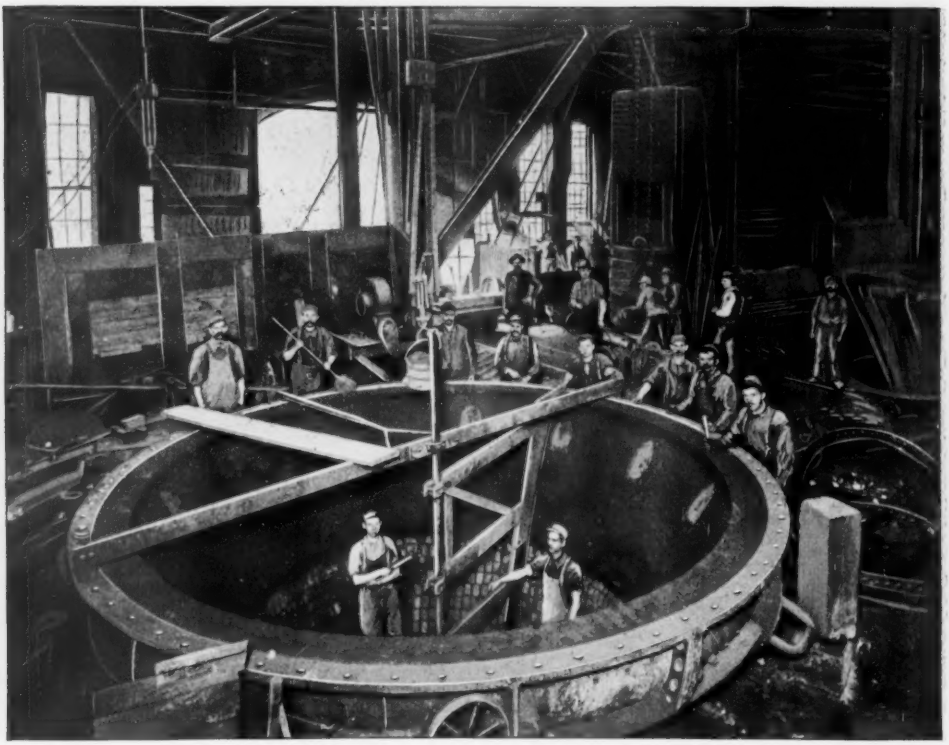


FIG. 2. MOLD OF TWENTY-TWO TON "A" FRAME AT THE ALLIS FOUNDRY, MILWAUKEE.

open. In other words the resistance in higher carbons is lower on account of the fine granular construction; and in low carbons resistance is higher, because of the greater homogeneity possible, together with the increased size of crystals. The softer the steel the more favorable will be the specification for electrical work. In fact all motor frames and boxes, and heavier dynamo castings are usually specified as low as .12 carbon.

Steel is naturally a very sluggish metal, for the life which was contained in the pig iron of the burden has entirely disappeared, and for it has been substituted the heat of the furnace, or induced heat, which fact alone compels the using of all dried molds, and the casting being made under pressure. Steel chills almost immediately upon contact, and has absolutely no latent life of itself to follow the openings of the mold, when poured under natural or normal conditions. In the successful casting of motor boxes and frames, when patterns have been quite rangey, great credit is due to the individual melter, who brings his heat up to the conditions required, when casting ⅜-inch sections. In the larger and heavier shapes met with in electrical work, the feature of segregation has yet to be satisfactorily overcome. A casting having shrinkage cavities or blow holes will not give efficiency in service. There are several causes for the presence of blow holes, one of which is that open-hearth castings are produced under an abnormal heat, which hastens the volatilization of carbon, but does not in turn admit of the proper elimination of the occluded gases, which are in evidence in steel more than in any other metal.

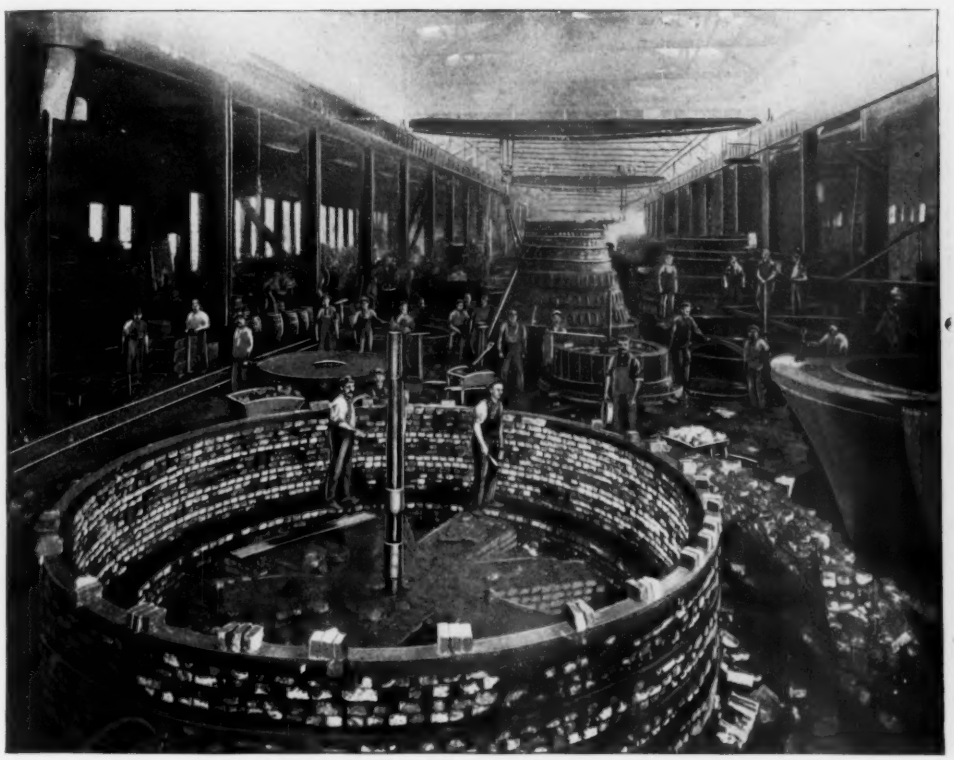


FIG. 3. THE ALLIS FOUNDRY, MILWAUKEE.

Open-hearth of the best quality is worked very slowly in the furnaces, though never under a low heat condition, and this is the one essential feature in melting—the ability to so regulate the gas and air supply that the heat is still maintained without scorching the metal, or melting the roofs of furnaces. An experienced man need but take one glance into a furnace to decide whether the air is doing its function. The volume of gas from producers and the pressure of the same is of course the mainstay, but gas is not the only essential component in the mixture. The ad-

mixture of air in the proper amount determines the duration of heat in furnace and also in a great measure, the quality of metal upon tapping. The excess of air introduced into furnace is never satisfactorily excluded from the metal, for steel while melting and working up is, like iron, an absorbent of all impurities directly in contact.

Another great point in furnace working is the ability on the part of the melter to know exactly when to make his test, and the time allowance after receiving analyses from the chemist before introducing the manganese. When the carbon is working down toward the desired figure—in the instance of steel for electrical uses, .18 to .20—a time when the furnace should be very hot, the rapidity of the chemist in returning analyses is very essential; for when the heat shows lower than, say, .12, and the melter endeavors to feed up with pig iron, he does not as a rule allow sufficient time to elapse for the total exclusion of the new carbon thus introduced. This new element, moreover, is never uniformly distributed, and almost invariably accounts for hard spots found in castings, besides holding sufficient carbon in suspension to produce a very undesirable metal. A heat should be allowed to come slowly and naturally, so to speak, and if it should be found necessary to "feed up" after the charge is melted there is some feature overlooked either in calculation of burden or heat manipulation. The very best metal is that which is not tampered with in any manner until the addition is made of the manganese, at the conclusion of furnace treatment.

FIG. 4. THE ALLIS FOUNDRY, MILWAUKEE.

Another furnace defect is prominent when the endeavor is made to operate after the bottom has become fouled. This has always proved fatal, whenever the risk has been taken. There will be incorporated in the metal the gases which arise from the porosity of the bottom together with the excess of silica then prominent and fusible. When the bottom is in this condition the heat will work up just as quickly as when indications are favorable, but there will also be present the ever telltale quality of slag, which will show an ab-

solutely dull appearance, denoting excess oxide of iron, infusible and detracting greatly from the life and fluidity of the metal.

Again, in the recarburizing with manganese the proper proportion, ton for ton, cannot be ascertained by any set rule. Rather it is the result of investigation based wholly upon the condition of the furnace, class of work under way, and the knowledge of characteristics present in the pig iron. An overdose of manganese will counteract all the previous good work of the furnace. In the molds to be cast will be found other tributable either to defects in the metal or the mold. Under such circumstances the crane hands will often be seen pounding green sand on the shrinkers, endeavoring to chill the metal, a procedure which rather increases the malady, for if there should be any chance of redemption, it would be found by allowing the gas full chance to escape, rather than retarding it.

Perhaps the latest and most interesting field opened for steel casting has been in the building of the modern locomotive. This high speed machine must be of a light con-

FIG. 5. CASTING A FIFTEEN TON DISC CRANK AT THE ALLIS FOUNDRY, MILWAUKEE.

causes for blowing and dirt in castings. Here there must be prevalent favorable conditions, some of which are perfect drying and sufficient vents to carry off the air and gases in the molds, which are excluded by the metals during pouring. A damp mold will generate gas instantly, and a mold which is perfectly dry, though cold, will also act in much the same manner. Molds should be warm, even hot, for the very best results of casting.

After a mold is poured and the ladle is taken away, if the shrinkers should be observed to be "bleeding," the cause is attributable either to defects in the metal or the mold. Under such circumstances the crane hands will often be seen pounding green sand on the shrinkers, endeavoring to chill the metal, a procedure which rather increases the malady, for if there should be any chance of redemption, it would be found by allowing the gas full chance to escape, rather than retarding it.

Perhaps the latest and most interesting field opened for steel casting has been in the building of the modern locomotive. This high speed machine must be of a light construction and in the heavier parts, where of old gray iron was dominant, cast steel is now specified. This has diminished the weight in the heavier parts at least one-third. The driving wheels are the principal castings on a locomotive, and the greater strength offered by steel, together with less weight, has appealed to designers at once. The specifications of two leading concerns are almost identical with one exception, which calls for the relieving of all internal strains, or annealing. The other concern does not mention this feature. It has been for some

years an open question whether the reheating or annealing really affected the physical characteristics; but on positive evidence the writer knows that careful annealing not only relieves the internal strains, but materially advances the tensile strength and elongation. The specific gravity and weight of castings is also increased to an appreciable degree, as the mechanical and chemical actions, which so completely change the complexion of the crystals, has affected the metal very greatly. It has been contended, and very justly, too, that if steel castings are allowed to cool in the mold, there would be no need of further annealing, but in the instance of driving wheels and other large castings the unyielding nature of the molds compels that castings be freed from the mold when metal is thoroughly set, otherwise the lighter parts, as spokes, etc., would shrink or pull away from the hub. The rim of driving wheels, which was originally one continuous circle, has necessarily undergone some radical changes when patterns were to be molded for steel. The rim had to be split so that it would not pull away during cooling. The parts of the modern locomotive calling for steel castings are principally driving boxes, rocker arms, cross heads, cylinder heads and saddles. The designs of some cylinder heads presents a pattern the successful casting of which would be a credit to gray iron founding, not to mention steel casting. The physical specifications for railroad work call for tensile strength between 60,000 and 75,000, with an elongation of 15 per cent in 8 inches.

In the building of the modern steamships and men-of-war, parts which were once considered as impossibilities in steel are now molded with great ease. The stem and rudder-post, which were always made of forgings, and in several pieces, are now cast in one piece; in fact as far as range of work goes the metal may be forced to travel almost any length required. The writer has seen poured a rudder-post and frame for Cramp, the flasks for which measured 30x14 feet, and the greatest diameter of the casting was not over eight inches. It is rather difficult to say unequivocally that castings are on a plane of equality with forgings in marine work. The seeming superiority of the battleship Oregon, in which was incorporated such a large amount of forgings, is because in the absence of a steel casting concern upon the Western coast, forgings there were cheaper than the freight on same parts from the East. This latter fact offers quite a negative argument for steel castings.

One of the most difficult patterns has been that of hawse pipes for the new ships, which because of its peculiar construction entails molding in three parts. Propeller wheels have long since ceased to be a dread, although of late instead of casting a whole wheel, the blades have been molded separately and then bolted to the hub. Should a blade become broken the wheel is not totally disabled, and this method also offers the great chance for repairs being made quickly. The turret gears and turning racks of late years have been cast of open-hearth, and these parts under service requirements are subjected to the greatest of shocks. There is yet, however, to be recorded a single instance of the parts failing in service. The greatest percaution must be maintained in the selection and treatment of all material entering into the composition of the metal, as phosphorus and silicon are greatly to be feared. In the basic open-hearth, phosphorus has ceased to be a detriment, as the dolomite lining has taken care of it by absorption. In the acid open-hearth furnace the only hope for final exclusion of phosphorus lies in the direction of some flux, yet to be named. Phosphorus makes steel "cold short," just as quickly as sulphur makes metal "red short," though with the slightly more favorable consideration that it does not always condemn the steel. Phosphorus is sometimes excusable, whereas sulphur is always barred.

Of course the great feature in all metallurgical operations is the final elimination of the carbon, and the approach to a chemically pure metal. The crystalline formation in open-hearth steel castings resembles greatly that which occurred in the original pig metal; in fact, it is almost a reproduction. The difference in chemical analysis would show primarily a loss of 3½ per cent carbon, together with varying amounts of the other metalloids. The great change in the two metals is quite noticeable, in the matter of resilience and cleavage, two properties not present in pig iron. The only explanation offered so far, for this great advantage of steel over iron has been from the fact that in following a law of metallurgy the lower the carbon the softer and more readily malleable will be the metal. This, however, has been but vaguely satisfactory. We might

advance the theory that in the passing of the carbon the size of the molecules has been reduced, permitting of a very close contraction under pressure, or malleability, also great evenness in fracture. The individuality of the molecule is never destroyed in process; its size and formation, however, may undergo severe treatment, but the molecule disappears only in the volatilization of matter.

All the steel of commerce is primarily cast, and the same heat is capable of many and varying developments, according to the methods employed in working it up. The fluid compressed steel which enters so largely into armor plates, etc., is the direct result of mechanical rather than chemical reactions, for the scope of the latter really terminates when the metal ceases to be liquid. The mechanical treatment of open-hearth steel is the most expensive operation in metallurgy, for it requires the greatest of care combined with the most perfect working mechanical devices. Some idea of the cost may be gathered by the government limiting the cost of armor to $400 per ton. The question is now being debated very thoughtfully whether the operations are not over intricate, and whether the same results cannot be obtained by shorter routes. The argument emphasized by the supporters of present methods is that too much care cannot be given this branch of the industry.

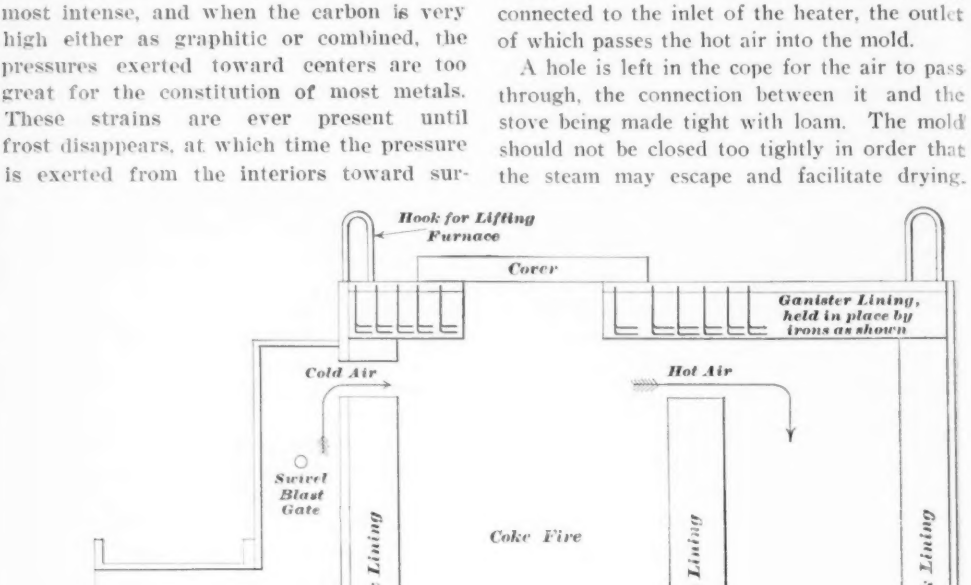
In 1887 the American Steel Casting Co. submitted to the government a 6-inch breech-loading rifle of open-hearth cast steel. The gun was cast at Chester, Pa., and today adorns the lawn in front of the office there, bearing this significant legend: "By Act of Congress." This gun was not submitted to any mechanical treatment after casting, and did successfully withstand the statutory test of 10 rounds, under service charges, with a velocity of 2,000 feet per second. There was a slight increase in the diameter of barrel after the tests, however, and the government board rejected the gun at once. There have been many comments passed upon the summary of this test, some of them not complimentary to the board, as its decision seemed to discourage other efforts in this direction. In 1898 this same company cast the jackets and tubes for the Brown segmental wire-wound gun, the success of which is yet to be pronounced, though the cause of any disappointment is not in the metal. Cast steel has never been given the opportunity to develop in this connection, as it is certainly entitled to do, since the history of earlier experiences still hover near us, to the great prejudice of the metal. In ordnance, subsidiary castings, as gun-carriages, levers, and racers for disappearing stands steel has entered one of its most successful fields, it being very doubtful if the substitution of forgings could have accomplished the desired ends with as great satisfaction.

The next development of steel castings will be the perfecting of process to allow of casting small shapes in green sand, thus obviating baked molds. At present all molds are baked in ovens and faced with pure silica to withstand the action of the molten metal. This is in itself very expensive when small shapes are being cast. The Tropenas process of cast steel has been introduced to overcome just this situation by producing a metal containing more latent energy than the open-hearth. This metal also possesses great carrying properties, more clearly described as fluidity. While the chemical composition does not vary greatly the mechanical treatment in the converters produces one of the hottest of steels. Tropenas castings in small shapes compare with forgings in every particular. There are several experimental plants already erected in this country, the process being introduced from Europe.

A class of work which has long been considered as undesirable for open-hearth steel is bridge work. There is perhaps no construction as vital to human interests as a bridge, and nothing of an uncertain quality should enter into its building. The designers of the new East River bridge at New York made a great advance for steel when it was specified for the anchor-plates throughout the structure. These plates varied in weight from 800 pounds to 15 tons, at which latter figure the bed plates were cast. These castings are all of a design which would have been considered extremely difficult when cast in gray iron, yet by keeping the carbon at .22 and pouring with metal not too hot all the anticipated troubles were obviated. The greatest trouble experienced was in making cores for the chambers for tie-plates. These chambers were so narrow and deep that in some instances the most carefully prepared core was turned into glass by the extreme heat encountered.

A great factor in favor of steel for bridge work is its great malleability in withstanding

shocks and concussions, and also the decreased liability of cracking under the severest contractions of frost. The internal strains of metal during cold weather are most intense, and when the carbon is very high either as graphitic or combined, the pressures exerted toward centers are too great for the constitution of most metals. These strains are ever present until frost disappears, at which time the pressure is exerted from the interiors toward surfaces, due to the expansion of the molecules. But strains of this character are never as dangerous as contraction, for there is always room for its ready and necessary relief.—E. C. Wheeler, in Iron Trade Review.



SECTION OF FURNACE
For Drying Molds with Hot Air.

Drying Large Molds.

For drying large molds nothing is superior to hot air generated in small portable heaters. The illustration shows a sectional view of the Piften stove, which we use in our foundry at the present time.

In operation cold air is furnished by a fan through pipes located along the foundry walls, and from these mains flexible connections distribute it to wherever the mold is located, being connected to the inlet of the heater, the outlet of which passes the hot air into the mold.

A hole is left in the cope for the air to pass through, the connection between it and the stove being made tight with loam. The mold should not be closed too tightly in order that the steam may escape and facilitate drying. Some judgment is required that the mold may not be burnt, and in practice it is best to protect the surface of the mold where the hot air enters by a plate, an inch or so in thickness, raised three or four inches above the face of the mold.

About twenty-five pounds of coke is required to start one of these heaters, and a hundred and sixty pounds will dry a very large mold in three or four hours.

If the mold should have a very large area

it is best to use two heaters. These can be regulated according to the pressure from the fan. The heat obtained can in this way be varied in temperature from that which is necessary to dry steel molds, converters, ladles and the like down to that which is enough to skin-dry ordinary work in the iron foundry, which has been found to work best at about 500 degrees Fahr.

This system of drying molds is economical, clean and handy, and most satisfactory in every way. The illustration shows the general points of construction in these heaters, part of the air being blown through the fire, the balance passing over it and down into the mold.

A. W. PEARSON.

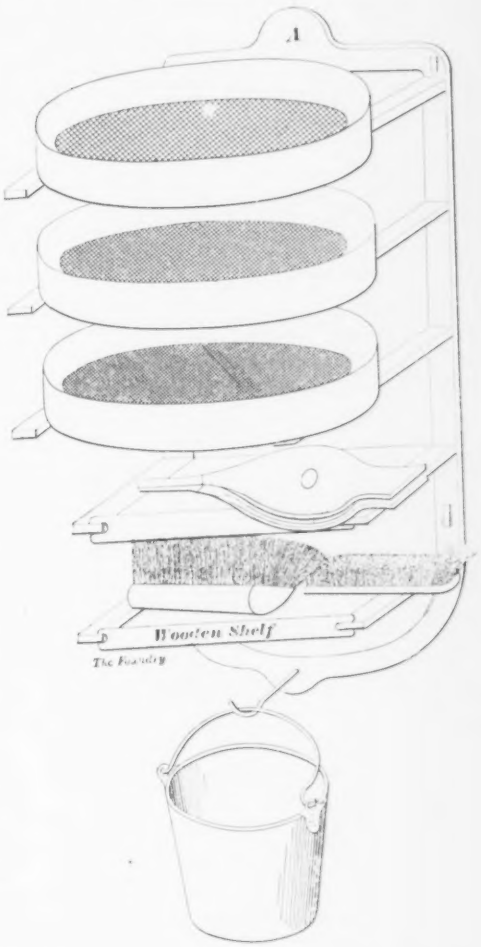
Newark-on-Trent, England.

A Place for Everything.

The tools required to work a foundry are many, and to keep the molder at his work molding, numbers of each of these tools must be to hand. We frequently hear of molders loafing about waiting for riddles, buckets, and other articles which are in continuous use in the molding shop, and there is no doubt that valuable time is wasted and much bad language expended over these tools.

It is quite a common occurrence in many shops to see men waiting for their turn of the bucket or looking around fifty or a hundred yards away from their floors for riddles, etc. Some of this waste of time is saved by having plenty of the articles wanted, but even when a sufficient quantity are supplied the same thing happens to a great extent, for as the tools get away from a certain portion of the shop, the looking-round process goes on as usual.

To get over this difficulty we have rigged up the arrangement shown in the illustration. The frame is made of cast iron, no pattern being used, its shape is simply marked off on a level bed, and the prods knocked into the required depth and run in open sand. The first casting, being well dressed, served as a pattern for all the racks we wanted, the only difference in each casting is the letter, the first rack having the letter A, as shown in illustration, the second B and so on. They are nailed to the walls at a convenient hight at intervals, and each supplied with a set of tools, each article being branded with the rack letter and the men working nearest the rack are required to look after it. This they do sometimes, but not always, and to make this system work properly a boy is told off for ten minutes every night to set all racks in order. These racks have now been in use a considerable time, and we find that besides the saving of time before alluded to,



the tools last longer, as they are not kicked about the shop or burned when molds are being poured, and a carelessly used or burned tool is easily traced by means of the rack letter, to a small number of users.

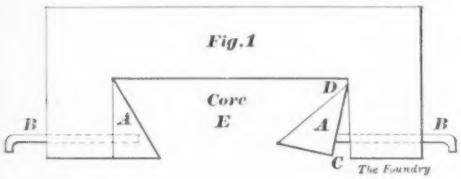
GEORGE BUCHANAN.

Dry Sand Cores.

Every foundryman and molder has his own private opinions as to when and where a dry sand core will give better results than one made from green sand. Taking into consideration this fact, the writer will not be

at all surprised should some who take the trouble to read these lines not agree with him.

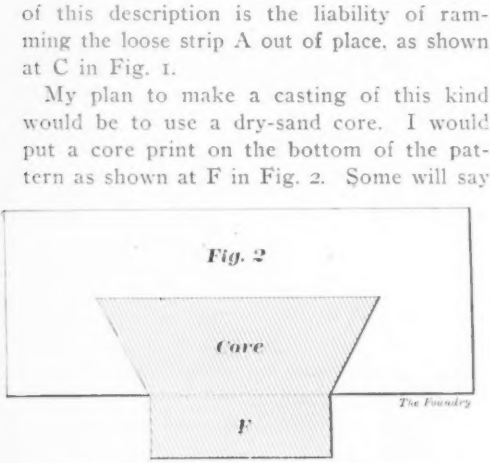
Whether or not a dry sand core can be used to advantage over the green sand core



depends upon the manner in which the pattern has been constructed. Take, for instance, Fig. 1, which is supposed to represent the end view of a slide casting thirty inches long. The loose pieces of the pattern shown at A are held in place by the pin B while the mold is being rammed up. This pattern has been made to enable the molder to form the space shown at E in Fig. 1, which is the core, in green sand.

In making castings of any weight this method is not always successful for several reasons. First, should the green sand core not be tucked very hard the casting will show swelled places at the point, D. Even when this green sand core is tucked solid enough to prevent swells, we have a worse trouble to contend with (scabbing). Another objection I have to a loose piece on a pattern of this description is the liability of ramming the loose strip A out of place, as shown at C in Fig. 1.

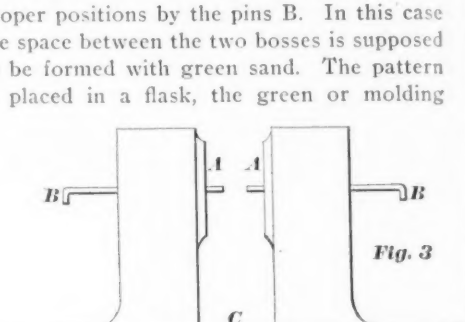
My plan to make a casting of this kind would be to use a dry-sand core. I would put a core print on the bottom of the pattern as shown at F in Fig. 2. Some will say



it costs more to make a core-box; probably it does, but it will cost less to make the pattern, for all that would be required to make this pattern when using the dry-sand core would be two straight boards. And I do not think the core-box would cost but very little more than the two loose strips. And when we take into consideration the greater number of castings that can be produced for the same money by using the dry-sand core, and also the more important items, the quality of the castings and the smaller loss in bad castings, it is easy to conclude that the dry-sand core is more economical.

In using the dried core to make a casting of this kind there would be no danger of swells, which alone would mean a decided saving in the machine shop, or any chance of ramming the loose strips, which form the dovetail, over or out of place. On the contrary, it is possible to make a perfect casting with cheaper and less labor.

I have made another rough sketch in Fig. 3. Note the two loose bosses, A, held in the proper positions by the pins B. In this case the space between the two bosses is supposed to be formed with green sand. The pattern is placed in a flask, the green or molding



sand is carefully rammed around it, including the space at C, Fig. 3. At this point rods or wooden soldiers must be tucked in to hold the core. When the pattern is nearly covered with sand and tucked solid at C to hold the bosses in place, the pins are drawn out and the ramming completed.

In drawing the bosses these generally cause more or less trouble by tearing down the mold and creating more or less dirt before they are safely out. A lifter and a looking-glass come in good play at this point. The quality of the castings all depends upon how hard the core has been rammed and how well it is vented and rodded. On the other hand, had the pattern been made with a core print as shown in Fig 4, and a dry-sand core used instead of the loose bosses, all the unnecessary work mentioned could be avoided and a perfect casting would be the rule.

Fig. 5 gives us the interior of a mold for the lower shell of a meter. This casting is about twenty inches in diameter and three-

eighths of an inch thick. When not made on a special molding machine it has been made as shown in Fig. 6, which shows us a three-part flask rammed up, the pattern

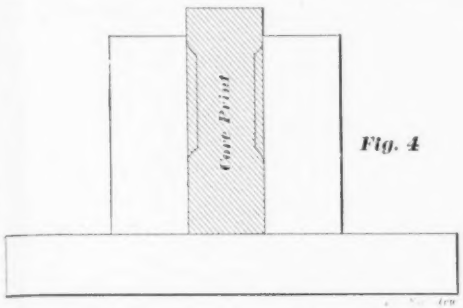


Fig. 4

drawn, and the core set. The flange A is loose from the other part of the pattern. To show the amount of work involved in forming this flange with a green-sand core let us recapitulate the operation. The pattern is placed on a board with the nowel and rammed up, a parting being made at the top edge of the loose flange, A, which comes flush with the joint of the flask. Then the bottom cope is put on, rammed up, and both parts are clamped together, rolled over, and a parting made flush with the joint of the flask. The top cope is then rammed up when, as soon as the gate pins are withdrawn, a level and soft bed of sand is made, and the entire flask is clamped together and rolled over. This is done to enable the molder to lift off the bottom cope and draw out the loose flange, A. Then the bottom cope is put on again and the entire flask rolled back, the top cope lifted off, pattern drawn, gates cut, core set and mold closed for the last time. Providing none of the sand hanging above the flange, A, which must be well rodded

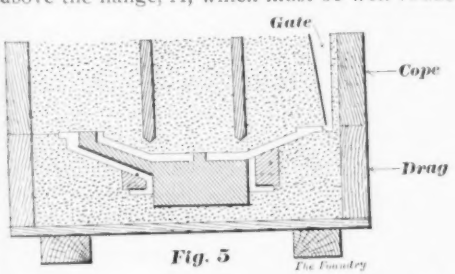


Fig. 5

and vented, has dropped off while being rolled over, we may expect a fair casting, but at what cost?

In this case I think a core print should be used on the pattern and a dry-sand core placed in the mold to form the point indicated by the letter A in Fig. 5. When made this way only one cope need be used, and no rodding would be necessary. It will not only make a cheaper casting but a cleaner one, because every little hard spot at such points on a green-sand mold make dirt. And the chance of a drop-out over the flange, A, is avoided.

The above is but an instance wherein the dry-sand core has advantages over the loose pieces on patterns or green-sand cores. There are some very light castings that can be made much better and cheaper by using loose pieces, or green-sand cores; but in ordinary practice experience has taught me that the dry-sand core is the safest and cheapest.

I have not made these remarks without realizing that considerable space has been consumed in what old foundrymen might term "kindergarten talk." I know that a

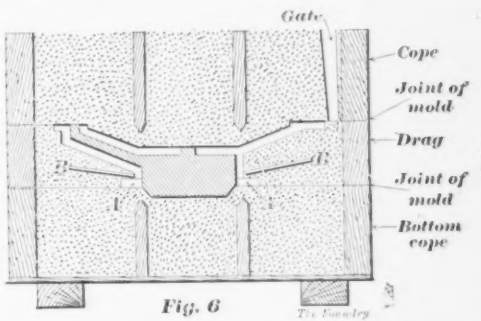


Fig. 6

great deal is written on foundry subjects that may interest old and practical molders, but which is of little benefit to the young man, because with his limited experience he is unable to understand the more advanced ideas. I think we are doing that which tends to improve the conditions of the trade when we occasionally express our views on what are generally considered subjects of minor importance.

P. R. RAMP.

Making Names on Castings.

There are but few manufacturers who do not desire to have their name appear on machines which they produce. The ordinary lettering of patterns is relatively easy of molding unless the patternmaker should have selected a style which have but little draft. This is something which should not be done, for if there is anything that disfigures a casting it is a patched letter.

Where the greatest difficulty is encountered

in producing a perfect name for a casting is when this must be molded after the pattern is drawn or when placed in a vertical position. In many shops the firm's name is attached to a plain board, and after the pattern is drawn

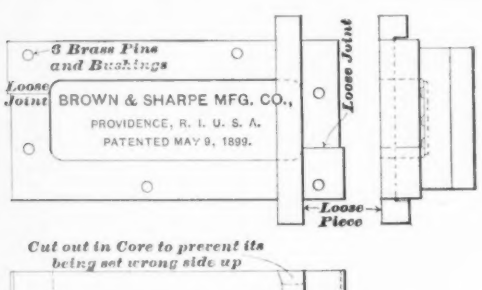

3 Brass Pins and Bushings
Loose Joint
BROWN & SHARPE MFG. CO.,
PROVIDENCE, R. I. U. S. A.
PATENTED MAY 9, 1899.
Loose Joint
Loose Piece
Cut out in Core to prevent its being set wrong side up
White Metal Plate
Loose Joint

Fig. 1

the projecting letters are forced into the surface of the mold with the aid of a mallet. This plan cannot be said to be first-class, and it is really surprising that it turns out names as well as it does. Pounding a number of heavy letters into a mold makes the surface harder than it ought to be. The jarring incident to this also has a tendency to loosen the minor portions of the letters.

The "American Machinist," through the courtesy of R. Viall, superintendent of the Brown & Sharpe Mfg. Co., at Providence, R. I., recently illustrated the practice of that

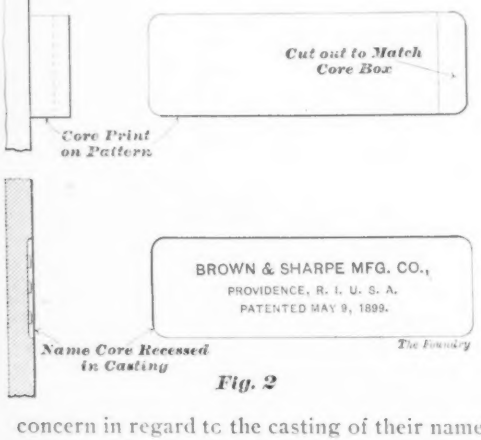

Cut out to Match Core Box
Core Print on Pattern
BROWN & SHARPE MFG. CO.,
PROVIDENCE, R. I. U. S. A.
PATENTED MAY 9, 1899.
The Foundry
Name Core Recessed in Casting

Fig. 2

concern in regard to the casting of their name plates, and from this journal we reproduce the attached illustration.

The lettering is done by a core, which not only gives a sharper impression, but is also less subject to the changes in manipulation of ordinary molding sand by the molder. These cores are made from a fine sand to which is added a small amount of core compound, the latter having shown itself to be preferable to flour by producing a sharper letter.

Fig. 1 is a sketch of the core box, and Fig. 2 shows the pattern with projecting core-print, and, in section, the inset of the name-plate. The projecting thickness of the core-print is less than the thickness of the core, so that when the core is in position in the mold the face of it is within or below the normal surface of the casting, but not so low as to sink the faces of the letters below the casting surface. These preferably project slightly, so that, if desired, they may be ground or otherwise faced. The core, it will be noticed, has a thinner portion on one end, with a corresponding shape provided on the core-print. This prevents setting the core the wrong way and inverting the letters.

Use all the Means at Hand.

In the January number of THE FOUNDRY appeared a very interesting article on "Serving his time," which will well bear reading; yet I believe much could be said on the same line that every ambitious man learning molding needs to give careful heed to.

Let the young man go among the journeymen in his own shop and try to borrow some books on molding, or a few of the latest copies of THE FOUNDRY, and he will begin to know why it is so necessary for most of them to keep moving around to ever gain confidence.

How would you like to employ a doctor whose only skill came from trying various drugs on his patients and seeing whether they got well or died? Is not a man who does not read and study about his trade much in the same position?

I think I am safe in saying that three-fourths of the molders go without their trade publication, and that one-half of them do not own five dollars' worth of books relating to their trade.

Every piece of work made in a foundry is based on certain fundamental principles, and unless these are mastered, the experience that is gained by travel and change is not built on a good foundation. While it is valuable as furnishing a larger means of comparison to judge a strange job by, it would be

much more valuable if built on a proper understanding of the science of the trade.

A few dollars spent in the best literature of the trade would be worth many times the amount spent traveling around trying to see new methods.

I can hear the man who never reads or owns a book say: "I know so-and-so that wrote some of these books, and he used to lose lots of castings. I got more bad castings when I worked for him than I did anywhere else; one fellow had all of his books and he couldn't make a good grate bar."

This may have much truth in it, as owning books won't give you brains, and reading without using your own judgment isn't any better than ramming sand without it.

How many men would know how to figure up the heat if the boss was sick, or how to have the cupola charged, or what irons to mix to get such results as are being gotten every day all around them? How many can measure their patterns and tell what the castings should weigh? How many ever figured what their labor was worth when their castings were rough, too bad to use but just too good to throw away, compared to good ones? Do all of them know the proportions of all that goes to make up mixtures for core-sands or washes? These and many more things can be learned by reading.

To go from a foundry doing small, light work, to one doing large work, or the reverse, is all right. But to go to a general shop from one just like it is not of great value.

Ask the first foundry foreman you meet what men he holds most valuable, or who he would pick for an assistant, and you will find it is the man or men who think deeper than the surface of their work. The man that sees a job done in a great many ways, and follows blindly without knowing why, is apt to have that many more ways of getting bad work.

There are a great many things going on in every foundry that a man does not get a chance to try, no matter how long he works there, but by consulting his trade publications and making a small expenditure for the current trade literature, the hidden is laid open and made plain, and very often he can thereby know more of what is going on in distant foundries than many of the men working there.

I venture to say that there are men working for the Westinghouse Machine Co. in their foundry that will never know as much about the holding of the large flasks as is shown in the illustration on page 209 (January).

Reading and studying will not supply the place of everything by any means. It is only a part of the equipment, but if you are a good man without it, you will be a better one with it. You may be able to make good work with few and poor tools, but if you had more and better ones given to you, you would not give that as a reason for bad castings.

Giving these tools to a laborer will not make a molder of him; at the same time they will not make it harder to instruct him than if he had to do the work with the poor set.

When a young man has used all the means of reading, studying, and observation within his reach and finds himself still hungry, let him go, and keep going as long as he keeps growing fast enough to pay, but don't let him go with the idea that mere going and working on strange pieces will make a shop foreman out of him, or that wisdom will catch and stick to him like burs to a cow that is wandering through the brush and weeds.

This is not intended to discourage any ambitious man, but rather to encourage him to use all the means at hand, believing there is plenty within reach which it is of value to learn. W. OSBORNE.

Chimmie Powers' Answers to Correspondents.

Six Little Molders: Send me a sample uv de sand, an a sketch uv de lug yu ses dat blows every time, an de name uv yer foreman.

Texas: You loose, Pat Leonard wus never in China, but he wus in Chinatown wonct er twice in Cincinnati.

Willie B.: (1) Jack Reeves made de castin yu speak uv, an dey did have tu tear de wall down tu get it out uv de shop, dey couldn't break it up inside. (2.) Mix yer facing one tu seven, six shovels full uv sand tu one uv nails an watch the result. (3.) If de flast stood five days on de floor before it was cast, den de mold musta got sour, dats why yu lost de castin, dat happens lotsa times.

M. Y. Self: (1.) Take yer time nex' time, an if shes bad agin draw yer time 'fore yu get canned. (2.) Keep yer tools bright if you wanta be a good Molder, an geta be a foreman. (3.) Mr. McKinley belongs tu de Bricklayers, but not de Molders.

Mendota, Ill., Mr. Powers. Dear Sir: I have $1,800 in cash fhat was left me by an

Uncle, am just out of my time, and am twenty-one years old, and have a good home, and a fair job, steady, and fair pay, but am ambitious, and would like to invest my cash in the Foundry business in some good locality, with the ultimate intention of course of becoming a Millionaire, can you advise me as to best location, etc. Yours, PERCY GREEN.

Say: Percy dat coin come easy to you, an if sum one don't trow cold water on yer ambition, its goin to go easy, if yu hada dig dat much coin outa de sand heap, youda be thinking uv doin something else wid it besides burnin it up in a Foundry, lots a Foundry owners now days don't make as much as de Molders workin' fur dem, dats strait, an if dey didnt have good nabers, sum uv them would go hungry half de time, dis is on de quiet, but if you insist on lookin' fer a bargin in gold Bricks, I kin put you on all right enough. if you want tu work yer self up in de woild, why don't yu start a s'loon, get inta politics an be sum body.

S. A. D.: (1.) Yes: Fill Lawless is de main squeas. (2.) If yu can't get de days work up yerself, why don't you puta man on, er else get yer self a pair uv rubber boots so you kin bounce around quicker.

Paris, Ind., Mr. Powers, Dear Sir: I have a good class of work in my shop, such as Engines, Gears, Pulleys, etc., and of late am having an awful time with Molders losing work, and they won't stay only long enough to get a pay, am paying good wages to. ($2.00 per day), and am not very exacting about a big day's work either, and don't ask them to do any more than they can, but they won't stay. Kindly advise me in this matter and oblige. John New. Foreman.

Hire sum Molders Jack an give dem $2.50 per, er a little more, an see if dey don't "stick." $2.00 per won't buy cigaretts fer de average Molder, apprentice boys gets dat much out west, an you don't ask dem to do any more den dey can? Well your just all right.

Jasper, Mich: Mr. Powers: Kindly examine the enclosed sketch, and see what you think of the rig, the casting is a difficult one to make, and each one weighs six hundred lbs, and with this rig two men can make three a day. Could you improve on it? J. P. Sanders.

Why cert, de rig kin be improved on, dey make dem things on de bench in Chicago.

D. I. G. (1.) Dont pour any metal in de mould, den yu wont spoil it. (2) Sandy Knight never carried de hod dat I knows of. (3.) Better shake it out. (4.) Give de gaffer a bum steer de first chanst yu get.

J. C. (1.) Rite again an tell me how thick de bottom board wus, an if you had any jaggers in de Cope, den I kin tell whut made it skab. (2.) Take a mout full uv black oil an blow it on de teet, an see if dat dont fetch it. (3.) Rite tu Chaw Cunningham, he kin give yu a good mixture tu make it peel off. (4.) Fer a deep lift like dat, lay a bag in it, den wen de copes rammed up tie de bag tu de bars, an she'll lift clean every time.

S. E. ATTLE.

CAST IRON NOTES.

Devoted to inquiries from Practical Foundrymen on the subject of Melting and using Cast Iron. Address all inquiries to W. J. KEEP, care of The Foundry.

WHAT CAUSES POROUS OR SPONGY SPOTS IN ENLARGED PARTS OF A CASTING?

Answer: After a mold is filled, a thin film of iron becomes solid against its sides. This shell increases in thickness by the formation of groups of crystals which project inward from the inner surface. While the interior is still fluid the shell becomes perfectly rigid.

If the top surface of the gate through which the iron entered is broken through, the melted iron is seen to sink slowly. If it remains fluid long enough it will sink out of sight, leaving a tapering hole or "pipe." To make melted iron fluid enough to fill a mold, it is raised to a much higher temperature than is sufficient to melt it. This excess of heat has considerably expanded the fluid iron, and it must shrink to its bulk at the time it melted before it can become solid. But as it cools down more crystals form all over the interior sides of the casting.

It is self evident that there can never be any crowding of crystals. The first of these on the extreme surface are very small and close together. After a continuous rigid shell is formed the decrease in bulk of the fluid interior must cause spaces to form between each crystal or else a cavity will form at some point. But the cooling which decreases the bulk also brings the fluid against all sides to the frezing point, therefore crystals continue to form with constantly increasing spaces. When the casting is of such a size that the

crystals in the portion that cools last are attached only to the walls of the inside, and cannot touch the neighboring crystals at their sides, the metal is not only coarse grained but is spongy. When the last crystals form they do not reach those projecting from the other inside surfaces and a cavity is formed.

The surface of the casting has cooled down considerably and has shrunk so that it is smaller than when it first became solid. The internal portion must shrink as much, and as each crystal is attached to the walls each moves towards the wall, and away from the crystals attached to the opposite walls. This causes the central portion to become more spongy and the cavity to increase in size.

This description of the process of solidification explains the formation of crystals in lines perpendicular to the cooling surface, and the lines of weakness where any of the inner ends of these strings of crystals pull away from each other.

All parts of a casting should be as nearly as possible of the same size. If it is impossible to reduce the size of some portion of a casting, methods must be adopted which shall feed fluid metal to the interior to keep the central portion full. Another way is to use a chill to hasten the cooling of the large part, as is done in castings for malleable iron.

The firm that asked this question says that they have found one brand of iron that prevents the sponginess when made a part of the mixture. It is of course best to use the iron which produces the soundest casting. One firm found that an iron with phosphorus at about 2.00 per cent and silicon under 1.00 per cent prevented spongy spots. The phosphorus greatly lessened the shrinkage of all parts of the casting. A low silicon iron becomes thick before it solidifies, and then the crystals form all at once, making a central cavity unlikely. It is usual to have the silicon as low as possible in large castings.

IRON MIXED BY CHEMICAL ANALYSIS.

A few weeks ago I made quite a trip through three states and visited nearly all the foundries in several large cities. Only one foundry used any physical test and only one anything like chemical analysis.

This founder claimed that he had every car of iron analyzed for carbon, silicon, phosphorus, sulphur and "magnesia." I asked if it did not cost him at least $10.00 per car and inquired how he could take care of his iron while he was waiting.

He said that a chemist in Cincinnati determined all the five elements for $2.00 per case, and did it quick. I then asked him to show me how he figured out his mixture.

We sat down at his desk and he said that he wanted 3.25 silicon, and very low sulphur in his castings. He produced the bills of the five cars that he had in his yard and on each was the furnace analysis of both carbons and all other elements. He said he was going to refuse to accept one car with silicon 2.75 because it was too hard to get the proper proportion. Two other cars had about 3.00 and 3.50 per cent silicon, and he said equal parts of those would give him 3.25. One car contained 4.00 per cent silicon, which he said was all right for him. I asked why he did not use equal parts of that and the 2.75 per cent, but he said it would make hard castings. He said he watched sulphur very carefully that if it got above 0.05 it made his castings hard. That he had tried Connellsville coke, but that it did not run regular. That West Virginia coke was the only kind that would produce soft castings. He said that he found the analysis on his bills correct and that he very seldom found it necessary to have analyses made.

Pneumatic Tools and Appliances in Foundry Service.*

BY W. P. PRESSINGER.

In discussing the employment of pneumatic tools and appliances in foundry work, it is not my purpose to describe any device not perhaps familiar to you all, but rather to present, in as brief and collective a form as the subject permits, the various appliances, which have lightened labor and reduced costs in foundry service, that are dependent upon compressed air as their actuating medium.

The introduction of pneumatic tools in a form marketably perfected for shop or foundry usage dates back but a few years, and their widespread adoption, remarkable for its rapidity, is, after all, the most convincing proof of their commercial value. To-day a boiler shop or machine shop devoid of compressed air equipment is a rarity, and if the foundry end of our mechanical community is

*Read at the meeting of the Foundrymen's Association.

not so well provided for, I venture to say that it is because the merits of labor-saving properties of pneumatic machinery have not, in the rapid development of the business, been as thoroughly demonstrated to the foundry trade. The day is near at hand, however, when a foundry without pneumatic equipment cannot produce its output in commercial competition with foundries that have adopted it.

The best known and most widely employed foundry appliance actuated by compressed air is the pneumatic hoist, originally used only in the straight lift, piston and cylinder form, but now utilized in a variety of types.

The horizonal hoist may be arranged for a lift of 2 feet or 4 feet for each foot of piston travel, when desired. Operated by a simple three-way valve, with no complicated mechanism, these hoists are well-nigh indispensable for duty not requiring an immovably sustained load. For this latter demand, where irregular action is not permissable, a more refined type of hoist is obtainable in which the incompressible qualities of oil are used to govern and restrain the sometimes too elastic properties of compressed air. This is accomplished by providing the hoist with a hollow piston rod filled with oil, thereby preventing a more rapid movement of the piston in its upward travel, than emission of the oil through the necessary controlling valve will permit. This form of hoist eliminates that element of danger which otherwise would be present in handling ladles of molten metal, and also permits of a sort of elastic positiveness which is so essentially desirable. In the actual work of molding, as in lifting copes and molds, drawing patterns and moving cores, the air hoists will do 50 per cent more work in an easier and better manner, without the danger of losing castings and with considerable saving in repairs. The peculiar adaptability of this device, properly rigged, as a drop or casting breaker, is apparent, since it is evident that the sudden release of the load could not possibly affect the regular and even progress of the piston in its return stroke. This machine will break three half-pigs into three pieces each, in one minute, and can easily break 20 tons of pig while a man is breaking up one ton by the old sldge method.

The Motor Chain Hoist is a more recently developed appliance, intended for similar service, and embodies compactness of form with rapid, even speed and perfect regulation. It consists of the motor familiar to all users of pneumatic drills, so combined with a chain hoist as to permit quick movement, accurate suspension of load and prompt reversibility. One of the latest types operates the motor in a bath of oil, avoiding the annoyance sometimes due to insufficient lubrication because of the inaccessible location in which the hoist must operate. These hoists, with adequate pressure, are made in sizes to lift up to 10,000 pounds in weight, at speeds varying from 10 to 36 feet per minute.

A most useful foundry appliance, familiar to all, is the Pneumatic Hammer for chipping castings, of which the general statement may be made that one man with one of these tools will customarily do the work of four men following the old methods.

The Air Drill is another very familiar labor-saving device in some classes of foundry work, though more peculiarly a tool possessing a wide variety of usefulness in the shop, where for drilling, reaming and variety of other applications seemingly limitless, it has established itself, next to the pneumatic hammer, as the most generally used type of air tool. When a large, heavy casting is to be broken up for return to the cupola, a small pneumatic drill may be advantageously used to drill a suitable number of small holes into which may be inserted a round taper steel wedge which, with a few well directed hammer blows, will sever the piece into parts suitable for remelting.

The application of the drill motor equipped as a casting cleaner, will appeal to you as a saver of labor and money without further argument when its immense speed and power are considered.

One of the most recently perfected pneumatic devices suitable only to foundry requirements, is the Pneumatic Sand Rammer. Accurately counterbalanced, the weight of this tool completely rigged is not quite 300 pounds, and operated under an air pressure of 40 pounds per square inch it will deliver an average of 300 blows per minute. The maximum stroke is 7 inches, but the length of stroke and consequently the number of blows delivered, may be changed at the will of the operator by simply varying the proximity of the rammer to the work. It is estimated that a greater quantity of sand can be rammed in a more effectual manner by this machine, than five men can do by hand.

Passing from the Sand Rammer, possibly the newest of pneumatic contrivances to serve the foundryman's needs, we reach what to me seemed to be the oldest and one of the most widely known, though perhaps not most widely used, of them all—the Pneumatic Sand Blast. Embracing a broad field of application and in some way adapted to the needs of almost every known form of foundry work, the adoption of the Sand Blast has been retarded somewhat through patent limitations and ultra-conservative methods of introduction. Another objection has been its wasteful utilization of what was formerly a most expensive comodity—compressed air—but this element of criticism is eliminated in a great measure because of the rapid strides in the development of economical and efficient air compressing machinery. The value of the Sand Blast for foundry use, if obtainable at proper operating cost, being universally conceded, I will sum up my reference to this device by quoting from the pamphlet of a manufacturer, treating the subject from an argumentative standpoint:

The question is asked, does the Sand Blast pay, for foundry use? And is answered with the qualification that it is difficult to approximate on general work. The argument continues, that on ordinary iron, steel, brass and bronze castings, one man operating a Sand Blast apparatus consuming 120 feet of cubic air per minute, will clean more surface and remove more cores in a given time than is possible for from six to ten men to do with the hammers, chisels and brushes, and the finished work left by the Sand Blast is infinitely better than can possibly be produced by hand laborers. Burned sand or scale is removed rapidly by the blast, and not only does it effect a great saving in time and labor, but a further saving is effected on castings to be machined; the removal of the oxide in itself is a great saving on tools, and in many cases the tools can be run at an increased speed. This applies particularly to milling cutters. Difficult and intricate cores are readily removed, and in cleaning castings in the molding of which large quantities of wire nails are used, the sand is eaten away first, and subsequently the nails will fall to the ground, sand blasted, perfectly clean, and in condition to be used over again. In a number of foundries where the Sand Blast has been introduced the use of facings has been discontinued. In some cases the only objection, in fact, that has been made to the Sand Blast is an unpleasant habit of making defects too plainly discernable.

Another recent improvement in connection with the Sand Blast is the application of it in conjunction with tumbling barrels. These barrels run very slowly, and consequently there is slight risk of breaking a fragile casting; neither are the edges of them worn off and destroyed, as in the case of the ordinary rattling at high speed. The castings are not cleaned by tumbling, but by sand blast inserted at one or both ends of the barrel. The usual time consumed in cleaning a charge of this barrel is from 20 to 30 minutes.

The Pneumatic Sand Sifter represents another method of utilizing the air drill motor for the needs of the foundry. With compressed air available for its operation, the value of this apparatus through saving of labor and attention becomes readily apparent. It can be moved from place to place in the performance of its work, saving the time and labor otherwise required to convey sand to a fixed sifting point.

I have refrained purposely from any detailed reference to the Pneumatic Molding Machine, a most important feature of compressed air foundry equipment, because the economy and value of this device have been so recently placed before you in a paper devoted exclusively to the subject. Suffice it to say that the Pneumatic Molding Machine presents in itself a most potent argument for the introduction of the air compressor in foundry service.

The Pneumatic Painting Machine is a simple form of compressed air device deserving a place in this paper, because of its exceptional economy for painting the interiors of foundry buildings. One man with this handy utensil can cover more space and distribute the paint more evenly than four men using ordinary paint brushes. The air consumption is moderate and the results all that can be desired.

There are, of course, numerous special employments of compressed air in foundry work peculiarly adaptable to individual conditions but not of general interest or application, reference to which is not within the province of this paper, but such applications suggest the inevitable conclusion that when once you have compressed air available, the number of convenient and economical possibili-

ties that it presents to the progressive operator is surprising, and its field of usefulness in your service broadens with amazing, but none the less gratifying, rapidity. Second only to electricity in its fascinating possibilities, compressed air yields nothing to electricity as a power with properties peculiarly its own, inimitable and unsurpassed in the commercial development of our time, and with the constanly rising standard of efficiency in air compressing machinery, that most important power which regulates the value of pneumatic appliances, more widespread adoption is inevitable. Imperfect and wasteful air compressors, possessing the primary virtue of cheapness but with all the faults in the mechanical calendar, will do more to offset the resultant value to be derived from pneumatic foundry equipment, than labor antagonism, either secret or expressed. Therefore, to derive the most benefit from the installation of compressed air machinery, the selection of a compressor should be carefully considered. It is unwise to install a compressor just about equal in capacity to present requirements, good practice being to provide a compressor at least 50 per cent greater in capacity than immediate necessities demand. Compressors of the duplex type are divisible, permitting the installation and operation of one-half at first, and the other half when the additional capacity is needed. The theoretical capacity of an air compressor stated in the list of the maker, is not the equivalent of the actual volume of air needed for the service. All makers list their compressors according to theoretical measurement, but the efficiency of the compressor is determined by the volume of air actually delivered with a given consumption of power. The cheap air compressor usually proves the most expensive. If a water pump fails in its work, or if a steam engine is deficient, the shortcomings are self-evident; but if an air compressor is poorly designed or badly constructed, it may continue in the evil of its ways until the scrap heap claims it for its own; unless, as is more likely, an absolute breakdown calls attention to its deficiencies and shows, all too late, that the hole it has made in coal pile, added to the cost of keeping it in repair, would have paid a handsome interest on the additional first cost of a properly designed and properly constructed compressor. Second-hand compressors are poor investments, unless known to have given satisfaction in service similar to that for which intended, and, in any case, the working parts should be carefully examined to see that they retain their full measure of usefulness. An air compressor, with valves, pistons, etc., worn out or in bad repair, can waste a great amount of power.

The use of air-brake pumps and direct-acting compressors is very bad practice, as statistics show that their steam consumption is about five time that of a crank and flywheel compressor for the same volume and pressure of air delivered. Install a steam-driven compressor, if your steam supply is plenty; otherwise a belted compressor may serve best.

Intake air to the compressor should not be drawn from a hot engine room, or from any point where dust is abundant. The volume of air delivered by the compressor increases proportionately as the temperature of the intake air is lowered, and dust or grit entering the compressor clogs the valves, cuts the cylinders and generally impairs the efficiency.

The selection of an air receiver should have careful consideration. Compressed air under 100 pounds pressure will leak a horsepower through a 1-16th inch diameter hole in five minutes, and a well-made, strong and tight air receiver is the second essentially important factor if you would realize to the utmost all the advantages which compressed air provides.

Test the air piping under full pressure when it is installed and at regular intervals thereafter, allowing the pressure to remain an adequate length of time, and if the gauge indicates leakage, locate and remedy it. To secure the best results and eliminate moisture from the compressed air, connect your pipe leading from the compressor to the top of the receiver, and lead your air pipes to points of consumption from the bottom of the receiver. Proper provision should be made for draining condensed moisture at regular intervals in the system. The simplest method is to slightly incline the branches leading from the main line and insert drain-cocks before the hose connections are reached. In pneumatic equipment, as in all things else, the proverbial ounce of prevention saves the pound of cure. Experienced knowledge which the compressor maker or pneumatic tool manufacturer is ready to provide, coupled with sound calculation, will as-

sure the highest results and utmost economy. Whether to put in a steam-driven or belt-actuated compressor; whether it should be of the duplex or single type and have simple or compound cylinders; where best to locate the compressor and where to place the receiver; what size of receiver is adequate; whether the size of the plant warrants provision for re-heating the air—all these are points requiring careful consideration. In installing pneumatic equipment it is generally desirable to procure the entire outfit from one source. Thus, division of responsibility for the successful operation of any feature of the plant is avoided, and one guarantee covers everything.

Originality in the Foundry.

The French proverb, "Imitation is weakness," is very often exemplified in the foundry. Some workman will happen along and make himself conspicuous by using a slab core here, or a gate pin there, and in a short time about every molder in the shop is doing the same, not because he thinks it is the right thing, but for the simple reason that Smith or Brown does it that way. To illustrate a case in point, the following instance will bear out my assertion—although we must not lose sight of the fact that it is a

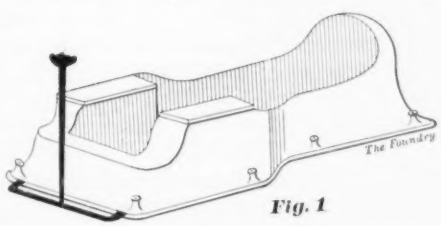


Fig. 1

poor rule that will not work both ways. A few years ago, while working as a molder in a Pennsylvania town, there was brought into the shop occasionally an engine bed pattern, which being made in a three-parted box was gated from the bottom joint of flask, one gate-pin being used, vertically, in the center of one end of box. A gate was then cut on the joint of drag, running parallel with end of flask, about the width of the pattern, and from this at right angles into the mold, as in Fig. 1. Not having a large demand for this style of engine, it was not considered a paying investment to make an iron flask, consequently a wooden one was used. So great was the strain in pouring, that it seemed an utter impossibility to prevent a "run-out" behind this channel or gate. Every precaution known to the art was used to keep the metal in the flask, but nearly always proved ineffectual, and frequently the casting would be "lost." Yet time after time the molder would employ the same method of gating. This job was given to "Jones" on one occasion, who thoughtfully studied some other mode of running. Instead of using one gate-pin in the center, two were used, one on each corner of one end of the flask, about as far

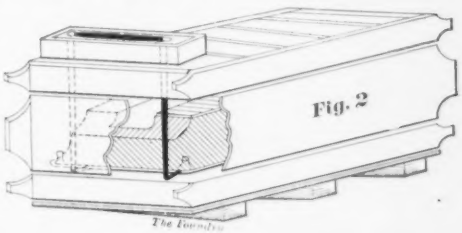


Fig. 2

apart as the width of the casting, then cutting gate direct into the mold from the holes made by gate-pin. After cope was lowered on, a runner box was used that encompassed both gates, as in Fig. 2. The object being, as anyone conversant with foundry matters will see at once, to reduce the pressure and also the gate surface on this lower joint to a minimum. When ready to cast, being approached by a fellow-workman with the inquiry, "Are you not making any preparations for a run out?" "Jones" replied in the negative, and when the mold was poured it was obvious that none were necessary.

H. W. BURY.

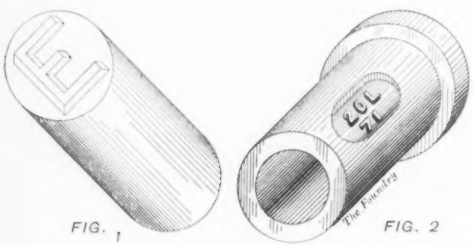
Marking Patterns.

Writing on this subject in "Machinery," George H. Hall says:

"As to the numbers themselves, they should be of sufficient size and form to stand out clearly on a casting, and for this purpose what is known as the skeleton Gothic letter is the most suitable. Letters and figures ¼" in height will give very good results if carefully molded, but wherever practicable, ⅜" or larger should be used. These letters, made from type metal, can be obtained at a very small expense. They should be fastened to the pattern with thick shellac and a few small steel rivets. If an iron pattern is to be made, the letters can be fastened to the master pattern with shellac alone, but when a pattern is to be used many times, it is not best to depend solely upon the shellac. If it be desirable to put new marks onto an iron

pattern, the letters should be cast on the end of small cylindrical stems, as shown in Fig. 1. Holes are drilled in the pattern and the stem is turned to a good driving fit and forced into the holes until the base of the letters are flush with the face of the pattern. This is a much more satisfactory way of marking iron patterns than trying to stick the letters on with glue or cement.

"Some little care must be exercised in putting



MARKING PATTERNS.

the marks on a pattern, as they must be placed where they will 'draw' well, and, at the same time, if possible, on a part of the casting that is not to be machined.

"In some cases it is possible to retain the mark, even where the piece is machined all over, by countersinking a small portion of the casting and having the letters raised above the surface of the countersunk part, yet not high enough to be machined off. This is illustrated by the bushing shown in Fig. 2."

Grog in Foundry Practice.

In the early days of the New England foundries it was customary for employers to give their molders and melters a certain number of drinks each day of Jamaica rum or whisky. These drinks received the name of grog, probably from the custom of issuing grog to the sailors of the Navy at that time.

This system was in vogue in the foundries for many years, and it is not so long ago since it was broken up, but that there probably are old founders and molders to-day who remember the grog custom.

When traveling in this section of the country some twenty-five years ago I met a number of these men. Among them was a foreman of a small foundry near Boston, Mass., who had been employed at that foundry as an apprentice, molder and foreman for nearly fifty years, and remembered the grog days very well, an account of which was brought out in the following way:

Noticing, while in the foundry office, a large number of old account books on shelves, I inquired if he had kept a cupola record of the amount of iron melted, fuel consumed in melting, etc., during his employment in the foundry.

He replied that they had never kept any separate cupola account, that the cupola had always been considered part of the foundry plant, the same as the engine, boiler, etc., and that no special book-keeping had ever been considered necessary, and they were not then keeping such a record.

"But," said he, glancing over the old books, "we have a record that was considered more important in my young days, especially on casting days, than a cupola record," and he took from the shelves an old, well-worn book, which proved to be the grog book,—the title given to the book in which the drinks served to each man were recorded.

In this book was found the name of every man employed at the works that was entitled to grog, and opposite each name was the number of drinks he had received each day.

The foreman, in explaining the book, said that during the grog days every man employed at the plant went to work at sunrise and worked until sunset, and was allowed three grogs a day —one in the morning, one at noon, and one in the evening.

The apprentice boys were not allowed any grog for the first two years of their apprenticeship, but after that they received the same number as the molder, which was three on mold days and five on melt days, as casting day was then called in foundries that only cast two or three times a week. Any greater number of grogs than this were marked "extra," and charged to the man's account, except on melt day, on which the melter was allowed any number of grogs he deemed necessary to enable him to make the cupola melt well. Molders casting large or important pieces were allowed extra grogs to insure good castings.

The record indicated that if the copula did not melt well and drop clean it was not for want of grog in the melter, for the book showed that he had received from none at all to as high as twenty grogs on a melt day, and this should have been a sufficient number to make any well-behaved cupola do its best.

Had a cupola record been kept in connection with the grog book, showing time of putting on blast, first iron, character of iron, time of melting heat, amount of iron melted, fuel consumed in melting, etc., much valuable information might have been gained for the guidance of

foundrymen at the present time as to the effects of a greater or less amount of stimulants in a melter upon the working of a cupola. In the absence of such a record it is fair to presume that the effect of grog upon the melting was not satisfactory, for the issuing of grog had been stopped a number of years before my visit to the foundry.

The book showed that a number of the molders and melters had received many extra grogs every day, and that a number of times the issuing of grog had been stopped from one week to several months at a time and resumed again. In explanation of this, the foreman said that the grog habit had grown on some of the molders and melters to such an extent that they were intoxicated most of the time and unfit to do their work, and the firm had made several attempts to break up the custom and reform the men by stopping grog entirely.

But every time they stopped it the molders and melters would quit in a body, or one after another until there were not a sufficient number of men to run a heat, and the foundry would be given the name of a "no-grog" shop, when no new men could be employed to take the place of those who quit, and the firm was compelled to resume the issuing of grog before the foundry could again be filled with men.

The custom was abused by the men to such an extent that it became a nuisance, resulting in great loss to both founders and men, and according to the foreman's statement the New England States must at that time have had the most worthless class of molders to be found in the country. They not only drank during working hours, but drank to excess in the evenings after quitting work, and would enter the shop in the morning so drunk that they would fall into their molds, or would be found asleep in the sand heap.

The melter would sometimes get so intoxicated on casting day that he would not know whether he was putting in fuel or iron, and on one occasion the foreman remembered of his falling into the cupola head first while charging same, and it was with great difficulty they managed to get him out before he was suffocated by gas.

There was scarcely a sober or industrious molder to be found at any of the foundries. This condition of affairs compelled the proprietors in certain districts to combine to break up the grog question, which they finally succeeded in doing. If the condition of the molders was really as bad as stated by the foremen, the abolishment of this pernicious custom must have wrought a great change. For at the time of my visit to his foundry there was not a more sober or industrious class of molders anywhere, and to this day they have maintained an excellent reputation, although there are localities in which can be found drinking molders, but these are generally foreign journeymen, who have been brought into this section from other parts of the country and from foreign countries.

After the breaking up of the grog habit founders who had suffered from the drinking habits of molders and melters were careful not to employ drinking men, and this custom was continued for many years afterwards. At the time referred to I met a number of foundrymen who informed me that they always inquired into the habits of molders before employing them, and had them watched after going to work, and if they were drinking men they were discharged at once. In this way they prevented the drinking habit from gaining ground. One of these men was Mr. Magee, founder of the Magee Furnace Company, of Boston, who said he always inquired into the habits of a molder applying for work, where he came from, and where he had worked. If he found he was a drinking man, or came from Troy, N. Y., or had ever worked there, he would not give him employment. "For," said he, "we have employed Troy molders a number of times and their first 'pay-day' they got a number of our molders drunk, and by the next 'pay-day' they had our men all ready to strike for more wages or some imaginary wrong in our shop rules." At that time Troy and Albany, which are only five miles apart, were the recognized centers of the stove manufacturing industry of this country. There were more than twenty stove foundries in Troy and vicinity, employing from twenty to three hundred and fifty molders each. At Albany there was a less number of foundries, but they were large and gave employment to as many if not more than the Troy concerns. The stove molders of these two cities had very strong unions, in fact every man employed in any of the shops was compelled to join the union, or he could not get employment. During the War of the Rebellion and for a number of years afterwards they had steady employment and received the highest wages paid molders any place in the country; but this was all changed later, and there was an endless number of strikes in these two cities.

On one of my visits to Troy, at the time of a general strike, I was informed by some of the

molders that the majority of the members of the union were not in favor of the strike and did not vote for it. I was surprised at this statement, as I had always supposed that each member of the union had a right to vote on such matters, and that the majority ruled. But on further inquiry I found this not to be the case, and learned it was due to the intemperate element among the molders getting control of the union. The latter elected all the officers and appointed the shop committees, and when any important matter was to come before them they would meet at a saloon, arrange their plans, and get half intoxicated before going to the meeting.

At the meeting, if any of the temperate or conservative molders arose to say anything in opposition to their plans, they would yell "Shut up!" "Sit down!" "Scab!" etc. This yelling would be kept up until the man was compelled to sit down, and he seldom attended another meeting. In this way the temperate and conservative element was driven from the meetings or compelled to submit to the program of the intemperate element without saying a word in opposition.

During the last ten years of Troy and Albany as stove manufacturing centers there was never a time when there was not a strike on hand. If it was not general, it was a local one, or struck jobs at some of the foundries, due to the arbitrary ruling of shop committees. The struck job generally followed the placing of a new set of patterns in the sand, which had been designed and prepared by the manufacturer at great cost to meet the demands of competition. Before the stove could be made a price had to be set by the shop committee for molding each piece. If this price was not satisfactory to the manufacturer, the entire stove or one or more pieces of it would be declared by the committee to be a struck job, and no molder was permitted to make it. Any attempt of the manufacturer to have the stove or struck pieces made frequently resulted in a strike of the entire foundry force.

These strikes were so expensive and frequent that the manufacturers scarcely got over the losses of one before they had another on their hands. A number of them, who have since moved their works from Troy, informed me that they did not make a dollar during the last ten years they were in Troy, and were compelled to move or go out of business. While it has been said that the industry was scattered from here by the market for stoves moving West, every manufacturer engaged in the business at that time in these centers knows that it was scattered by the frequent strikes of the molders; and every temperate, industrious man that belonged to that union knows that ninety per cent. of these strikes were entirely uncalled for, and were due to the intemperate element in control of the union.

Probably the worst lot of drinking molders ever employed in any one foundry in this country or Canada were those employed at Chippawa, Ontario, some forty years ago. This town is situated on a creek of that name which empties into the Niagara river just above the Falls, the foundry being only about three miles from the latter. I learned of this foundry and its inhabitants from a molder who was employed there at the time of its closing, and with whom I worked in a small shop for a number of years, and also from tramp molders who visited our shop looking for work. Whenever one of these tramps came along who looked like a drunken bum he would say, "Here is one of my friends from Chippawa." This frequently proved to be the case, and between them they would talk over old times at Chippawa. The foundry there employed about fifty molders in the manufacture of stoves, holloware, machinery castings, and general jobbing work, and in its day was the leading foundry in that part of Canada. They had plenty of work, molders were scarce, and the foundry management submitted to the drinking habit until they had nothing but drinkers. They were mostly young men from the States without families, and had no interest in the welfare of the foundry or the town, being ready to leave it at a moment's notice. They worked only when they pleased and drank to excess in and out of the shop, the foundry management loosing all control of them and being compelled to submit to their ways or close up.

One of their principal resorts was a tavern kept by a German who served an elaborate free lunch every night. The molders were continually playing tricks on "Dutchy," as they called him; and to get even with them and have some fun, "Dutchy" one night roasted the hind leg of a large dog for lunch. After they had all eaten heartily he brought in a large plate with the bone of the dog's leg upon it, with the foot attached to show them that they had been eating real dog's meat for lunch and that he had gotten even with them for their many tricks. This made some of them very sick and so enraged them all that they broke everything in the bar-

room, and then went outside and smashed every door and window in the house, completely wrecking it and giving "Dutchy" all the fun he wanted. To avoid being arrested for this they all went down to the Falls that night in a body and crossed the bridge into the States, where the scattered to different parts. This was the story told by my partner and corroborated by a number of tramp molders who worked there at the time.

Every molder left town that night, the foundry was closed and when some of them returned five years later looking for work they found it nailed up tight, and learned that it had never been in operation since the night they ate the dog.

Many a foundry has been permanently closed by drinking molders as was this one, including a number at Troy and Albany. I might relate the history of others, but these are probably sufficient to illustrate the disastrous effect of grog in foundry practice. There appears to be a difference of opinion among founders in regard to drinking molders. Some say that the latter are better workmen than temperate men; while others claim the reverse to be the case; and still others pay no attention to the matter either way, allowing their molders to drink or leave it alone, as they see fit.

The impression that a man under the influence of liquor is a better mechanic than a temperate one is entirely wrong, for there are equally as good molders who never touch a drop of liquor as those who keep continually under its influence or go on an occasional spree. And it is only a question of time when the drinking molder becomes a worthless one, while the temperate molder, if a good one, remains so until he gets too old to work. Founders frequently select a drinking man for foreman because he is a good molder. This is a mistake, for "birds of a feather flock together," and a drinking foreman will collect a lot of drinking molders in a foundry or have his friends among them, with whom he drinks after working hours and to whom he gives the preference in work and wages whether they are entitled to it or not, thus creating a feeling of discontent among the other workmen and fermenting endless trouble for the owner, who is unable to locate its real cause. Such a foreman frequently becomes "rum-dumb," and workmen will have no respect for him, pay but little attention to his orders, and in many cases the shop would be better off without a foreman.

On the other hand, a foreman who believes in temperate molders frequently goes to extremes in that direction, insisting on all his molders belonging to a temperance society, holding prayer meetings in the foundry during noon hour, etc., thereby collecting in the shop a number of temperance cranks who give more attention to this subject than to their work, and in consequence are often very poor workmn. Such foundries frequently find themselves as badly off for good workmen as do the shops which give drinking molders the preference because the latter are supposed to be better workmen when sober than the temperate ones. The founder who pays no attention to the habits of his men so long as they do their work properly is generally getting along the best of the three, although he, too, may meet with financial disaster due to the habits of his molders.

Foundry employees are a peculiar class of men. Their employment brings them in close contact with each other and they become intimately acquainted. In small towns where they meet after working hours one drinker may demoralize an entire foundry force. This is more especially the case in small towns than in large cities, where molders working in foundries seldom meet each other after working hours. The question of the management of molders outside of the foundry is, therefore, as important, if not more so, than the management of them in a foundry.

A foreman who takes a drink occasionally and goes about his business is not an objectionable man as a foreman, but the foreman who drinks with his men after working hours or keeps continually soaked with liquor is a very poor person for the place and one who will ruin the business of every foundry employing him, no matter how good a molder he may have been.

The molder who takes an occasional drink and goes about his business, and the one who goes on an occasional spree for a day or two and then works steadily for a month or so, are not so objectionable It is the man who drinks every night and wants to take liquor or beer into the foundry, and the man who gets drunk every pay-day and wants to treat all his shop mates and talk foundry with them while drinking, that are objectionable. The latter may get almost the entire foundry force into the drinking habit in a few months; and, as he has traveled and represents that he knows all about work and pay in other foundries, he may demoralize an entire foundry force in one or two pay-days and cause them to neglect their work,

quit, or strike for more wages or on account of some imaginary wrong.

The plan of the older New England foundrymen of inquiring into the habits of a molder before employing him and watching him afterwards is, therefore, a good one, and one that should be followed by every founder not located in large cities, where this would not be so practical as in small cities and towns.

The holding of prayer meetings or delivering temperance lectures in foundries during the noon hour to reform men is not a good policy. For men go to a foundry to earn a day's wages, and not to be preached to or lectured. Many of them have different religious views, while others think they do not require lecturing and feel that their rights are being infringed upon. Such meetings and lectures generally do the founder, who is often designated by the men as "an old crank," more harm than good. A better plan is to say nothing about religion or temperance in a foundry, but to quietly lay off every man whose drinking habits render his work unsatisfactory, or tend to lead others to drink. Should he desire further employment give him to understand that he can have it when he reforms. In this way a foundry force may be taught, without having them feel that their rights are in any way being infringed upon, that drinking men are not wanted. Men may be reformed who would grow worse if they were continually lectured on this subject.

Every foundryman located in a small town should endeavor to get his employees located and interested in the town, for this tends to break up their drinking habits, and also to have them take more interest in the welfare of the foundry than they do when they are free to pack up and leave at any time, which they may do for reasons not under the control of the founder and which would not exist if they had a family or other interests in the town.

It should be the aim of every molder who belongs to a union to attend every meeting and take part in its business. He should see that none but temperate and conservative members are elected to office or appointed on committees. If he fails to do his duty in these respects the control of the union is likely to fall into the hands of the drinking element, as did the unions at Troy and Albany, and he may find the means of earning a living for himself and family in the hands of a lot of men who do not care for work so long as they can get plenty to drink.

EDWARD KIRK.

Among the Foundries.

The Mineral Ridge (Ohio) Mfg. Co. will build a new foundry.

Charles Beebe has purchased the Matthews foundry at Imlay City, Mich.

The Philadelphia Roll & Machine Co. are building an addition to their foundry.

The Wright Foundry & Machine Works has started its plant at West Superior, Wis.

Harwath & Puckett's foundry, at Hickory, N. C., recently burned, will be rebuilt.

The Crystal Palace Foundry Co. is operating the Darrah foundry at Bridgewater, Pa.

Hay Bros., founders, Portage la Prairie, Man., have dissolved. Edward Hay continues.

It is reported that McFarland Bros. will build a foundry and machine shop at Jonesboro, N. C.

The Eureka Foundry Co., of Dayton, Ohio, will erect a new foundry in the immediate future.

It is announced that J. R. Cooke & Sons will erect a foundry and machine shop at Americus, Ga.

The W. E. Schaefer Mfg. Co., of Ripon, Wis., has become incorporated with a capital stock of $40,000.

Robert J. McIntyre has started a foundry at Oxford, N. J. He was formerly in business at Catasauqua, Pa.

J. E. Johnston, the proprietor of the Paris Machine Shops, is making plans to establish a foundry at Paris, Tenn.

The Essex Brass Foundry Co. is putting up a two-story brick factory building, 45 feet by 100 feet at Detroit, Mich.

The Richmond Stove Co., at Richmond, Va., have purchased additional property for the enlargement of their foundry.

The Allston Foundry Co., successors to the Barney & Reed Mfg. Co., have removed to 620 Atlantic avenue, Boston, Mass.

The Auburn Button Works, of Auburn, N. Y., are building a foundry to be operated in connection with their works.

A foundry to cost some $12,000, and to be 50x100 feet in dimension, is to be erected by the Syracuse Stove Works, Syracuse, N. Y.

Frank Baker has purchased the interest of A. A. Hamilton in the Iowa Mfg. Co., at Oskaloosa, Ia., and is now sole owner.

The W. J. Loth Stove Co., of Waynesboro, Va., is erecting a new foundry building which will nearly double the capacity of the plant.

The capacity of the Fort Madison (Ia.) Iron Works has been increased from 180 to 220

wheels per day. Extra workmen have been put on.

The Akron Engineering Co., of Akron, Ohio, will start its plant at an early date. The installation of machinery is very nearly completed.

It is reported that Thomas Bailey, of the Bailey Foundry & Machine Works, Athens, Ga., contemplates establishing a foundry at Elberton, Ga.

The Enterprise Foundry Co., of Knoxville, Tenn., who operate a foundry at Bristol, Tenn., intend to confine their manufacturing to the latter point.

The estate of Charles F. Ernst, at Buffalo, N. Y., is reported as intending to add a foundry to their plant for the manufacture of structural work.

The Conneaut (O.) iron foundry plant, which has been idle since last April, has been purchased by Erie men and will be put in operation soon.

Wm. Crick, of Independence, Mo., is having the debris of the recent fire removed from his foundry and will replace the old frame with a brick building.

The old foundry property at St. Charles, Ill., which has been idle for some time, has been purchased by Glen & Day and started with a force of 25 men.

The Elizabeth Street Foundry Co. has been incorporated at Chicago with a capital of $15,000 by Gustaf Anderson, Gustaf L. Johnson and H. C. Anderson.

Hertzler & Zook, Belleville, Pa., steam, water and gas engineers, are erecting a foundry and machine shop. The new plant will be equipped for the manufacture of machinery.

The Brown Car Wheel Works, at East Buffalo, N. Y., are being rushed with orders, and to accommodate the increase of trade another addition to their foundry is being made.

The Highland Foundry Co., of Denver, Colo., has been incorporated with a capital stock of $40,000; directors, Edward E. Stanchfield, Thomas S. Woodard and I. O. Stanchfield.

The Maryland Bed Co., Baltimore, Md., recently organized, will establish a factory for iron and brass beds, with capacity of 100 per day, at a cost of $30,000 to $40,000 when equipped.

The Conic Stove Co., Junction, Ark., has been incorporated, with capital stock of $20,000, by J. D. Proctor, president; Thomas Robertson, vice-president, and R. G. Brown, secretary and treasurer.

The machine shop of D. C. Richards & Sons, at Knoxville, Tenn., recently burned, will be built at once and on a larger scale than the old plant. It is said that a modern foundry will be added.

The R. M. Eddy Foundry Co., 43 to 61 Indiana street, Chicago, will erect an addition to their foundry. The building will be of mill construction, two stories in hight, and 50x100 feet in size.

The new foundry which is under construction at Cedar Grove, Wis., will be known as the Wisconsin Foundry and Steel Works. The plans call for a structure of frame 216 feet long and 80 feet wide.

The Wheeling Mold & Foundry Co., of Wheeling, W. Va., will build a new foundry specially equipped to manufacture sand and chilled rolls, rolling mill machinery and heavy castings in general.

The Norwood Engineering Co., Florence, Mass., pattern makers and foundry and general machine work, are building an extension to their machine shop of about 100 feet and an addition to their foundry.

The Grand Rapids (Mich.) Malleable Co. will build an addition to their plant at once, increasing its capacity one-third. The company now have 250 men on the pay roll and about 90 additional will be employed.

The business formerly conducted by Michael Fitzgerald, at Yonkers, N. Y., and known as the Yonkers City Foundry, has been absorbed by David E. Allen, of the Terrace City Foundry, who is now operating both plants.

The firm of J. D. & D. F. Snowberger, machinists and founders, at Martinsburg, Pa., has been dissolved, J. D. Brumbaugh becoming a member. The firm will hereafter be styled the Martinsburg Manufacturing Co.

It is reported the plant of the South Halsted Street Iron Works, Chicago, will be removed to one of the industrial suburbs within a short time, and that a large new plant will be erected as soon as a location is decided upon.

The St. Louis Car Co., of St. Louis, Mo., has added to its works a department, thoroughly equipped with brass foundry, babbitt metal furnaces and machine shop, which will be devoted to the manufacture of spiral journal bearings.

Barton, Maas & Co., general founders, Nineteenth and Rockwell streets, Chicago, have purchased considerable foundry equipment, consisting of cupolas, flasks, motors, etc., and

will at once extend their plant and increase their force of men.

The brass foundry which was closed at the Santa Fe shops, San Bernardino, Cal., nearly two years ago and removed to Albuquerque, N. M., is to be established there again, and brass castings for the lines west of Needles will be made there.

The Mahoning Foundry & Machine Co., Youngstown, Ohio, have selected a site for the new plant which they will build in the spring. The building will be of steel. It is the intention of the company to install two cupolas, one large and one small, in the foundry.

A new stove concern has been incorporated at Dalton, Ga., under the style of the Dalton Union Foundry & Mfg. Co. This foundry has a capitalization of $5,500. Sherry McAuley, president; A. J. Showalter, vice-president; P. B. Trammell, treasurer, and C. G. Spencer, secretary.

The Elkhart (Ind.) Iron Works have been sold to the Anderson-Reamer Chilled Plow Co., South Bend, Ind. The latter will take possession at once and put men at work making repairs and improvements preparatory to operating the plant, which, for some time, has run irregularly.

Application has been made for the appointment of a receiver for the Rogers Locomotive Works, of Paterson, N. J. The concern has ceased to exist as the Rogers Locomotive Works, the directors becoming trustees. The works will be sold to the highest bidder, as the law provides.

Figures are being taken on the new foundry of the Franklin Foundry Co., Chicago, which is to be erected at 1155 South Paulina street. It will be one story, 66x120 feet in size, of heavy mill construction, with frame exterior covered with corrugated iron. The cupola room will be 26x24 feet.

The Crescent Foundry Co., St. Louis, Mo., will erect a foundry 75x150 feet in size, one story high, of frame and brick construction. The equipment, besides foundry appliances, will include an electric dynamo, a 70 horse-power boiler, 50 horse-power engine and steam pump. The cost will be $15,000.

John Ramsey, who occupies the old Clark, Raffin & Co. foundry, at Ohio and Kentucky streets, Chicago, has contracted for the purchase of a South Side site for a foundry plant and a building to be erected for his occupancy. The property is 125x383 feet, and is located on the southwest corner of Sixteenth and Lincoln streets.

The new foundry and erecting shops which are under construction for C. Hanika & Sons Architectural Iron Works, at Celina, Ohio, are nearing completion, and as soon as they are ready part of the plant now at Muncie, Ind., will be moved to that point. The new plant furnishes 30,000 square feet of additional floor space.

The National Supply Co., of Baltimore, announce that they have purchased the entire plant and equipment of the Curtis Bay Brass & Metal Works, of Curtis Bay, Md. This plant is equipped with machinery and tools for the manufacture of car bearings, including electric, freight and passenger; also the heaviest of engine castings.

The work of repairing the foundry of Van Bergen & Co., Limited, Carbondale, Pa., founders, machinists and plumbers, which was damaged by the explosion of a boiler on November 18, 1900, has been fully completed. That part formerly used as a boiler-room will be converted into a brass shop, having been rebuilt for that purpose.

The Interstate Foundry Co., of Cleveland, Ohio, are, during the construction of their new plant in that city, operating the International Foundry at Ashtabula and the Van Wagoner & Williams at Cleveland. Their new plant, when completed, will be thoroughly up to date and the largest in Cleveland for the manufacture of light gray iron castings.

The Reder Foundry Co., 183 to 185 Newberry avenue, Chicago, are erecting an addition to their works. The new building will be 25 feet wide, 100 feet long and two stories high. It is of iron and steel construction, and will be used as a foundry and pattern shop. The company report that they have work enough ahead to keep them busy the next six months.

The Wm. A. Harris Steam Engine Co., Providence, R. I., manufacturers of the Harris-Corliss engines, have reorganized, and the plant has been conveyed to them by the assignees. The officers of the company are: Frederick A. W. Harris, president and general manager; William A. Harris, Jr., vice-president and superintendent; E. Francis Crowell, secretary and treasurer.

The Hyde Park Foundry & Machine Co., Hyde Park, Pa., will increase their capacity by building an addition, 60x80 feet, to their works, and installing a plant for the casting of rolls and heavy machinery. The work will be com-

menced at once and put in operation at the earliest date possible. The present expansion is necessary to meet the demands of their increasing trade.

The Union Foundry & Machine Co., of Catasaqua, Penn., have lately increased their capital stock to $100,000. They have purchased a new plot of ground near their present location, and are about to commence the erection of a new plant, having outgrown their present site. The contract for a new foundry has already been given out, which will probably be the extent of the building operations for this season.

The South Bend Malleable Iron Co., South Bend, Ind., manufacturers of refined air furnace malleable iron castings, have increased their capital stock from $75,000 to $100,000. This company was organized about a year ago, and have just completed their plant, which consists of four large brick and steel buildings, situated on a 9-acre tract of land at the junction of the Lake Shore & Michigan Southern and Grand Trunk railroads.

The Ames Iron Works, Oswego, N. Y., manufacturers of engines and boilers, have incorporated with a capital stock of $100,000. The new company succeed to the business of the copartnership formerly styled Ames Iron Works, and continue under the same management and along the same lines of business as the old firm. The officers are: Arthur L. Merriam, president; Allen Ames, vice-president and treasurer; Alfred H. Ames, secretary.

The National Gear Wheel & Foundry Co., of Allegheny, Pa., has placed an order with the American Bridge Co. for the construction of a 15-ton electric traveling crane runway in their foundry, which is 125 feet long; also for the erection of machine shop structural iron building, 24 feet wide by 151 feet long, with electric traveling crane to be furnished by Cleveland Crane Co. The crane for foundry will have 42-foot span, and will be furnished by Case Mfg. Co., Columbus, Ohio.

The North Alabama Engineering Co. has been formed at New Decatur, Ala., with Mr. H. K. Adams as general manager and J. W. Adams, engineer. The company purchased the plant first known as Ivens & Sons Machine Works, and also as the Alabama Foundry & Machine Works. Mr. H. K. Adams was for 15 years president and general manager of the Adams & Price Locomotive & Machine Works of Nashville, Tenn., and later proprietor of the H. K. Adams Engineering Co. of Nashville, Tenn.

The Dodge Mfg. Co., Mishawaka, Ind., is about to extend its machine shop and foundry. The two buildings will be practically duplicates of each other, 200x125 feet, of steel construction, with gravel roof and side walls of brick. Each will be provided with a 35-ton electric traveling crane, together with the necessary heating apparatus and other equipment. A new 72-inch cupola will be installed in the foundry, and the electrical equipment of the plant increased by the addition of a 150 K. W. generator and engine.

The Buffalo Foundry Co., Buffalo, N. Y., has been organized under the laws of the State of New York, with $10,000 paid-up capital. Officers are W. J. Hayes, President; F. L. Dunbar, Secretary; E. G. Rippel, Treasurer and General Manager. The company have leased the foundry department of the Eagle Iron Works, corner of Perry and Mississippi streets, Buffalo, N. Y., and will do a general jobbing foundry business. They will make a specialty of castings requiring very strong dense, solid and homogenous metal, and will confine themselves strictly to high grade work.

The G. L. Anderson Brass & Bronze Company, Birmingham, Ala., has been incorporated with a paid in capital of $12,000. The new company has succeeded to the business of the G. L. Anderson Co. (Ltd.), and are now occupying the bronze and brass foundry formerly operated by the latter. A new plant will shortly be built, and with enlarged facilities the company intend adding to their present line the manufacture of machinery and railroad brasses. The officers of the company are: G. L. Anderson, president, and Abe Rich, secretary and treasurer.

At the annual meeting of the Maywood Foundry & Machine Co., Manadnock block, Chicago, held January 29, the capital stock of the company was increased from $75,000 to $100,000. This was necessitated by the large increase in the company's business, entailing a very considerable addition to its plant. The company's works are now running day and night on accumulated orders. The following officers were elected at the meeting: President, F. E. Lonas; vice-president, I. L. McCord; secretary, H. W. Boies; superintendent, O. H. Davison.

Pattin Bros. & Co., of Marietta, Ohio, have completed and put in operation a new foundry, replacing their old foundry destroyed by fire September 18th last. The buildings are all of brick, with stone foundations and slate roofs.

The molding room is 50x120 feet, with steel truss roof. A traveling crane runs the entire length of building with facilities for loading and unloading material at both front and rear. The building is further equipped with all necessary modern appliances for the production of gray iron and brass castings. The adjoining buildings are a two-story machine and pattern shop, 30x40 feet, and a cupola stock house and cleaning room, 18x38 feet. A railroad switch will run into the yard, and new material will be delivered in close proximity to the stock elevator.

The Ramapo Foundry Co., Mahawah, N. J., have completed their new plant and made their first cast February 1. The main building, of ribbed glass and steel construction, is 380x100 feet, and is equipped with two traveling cranes and No. 8 and No. 3 Whiting cupola, capable of melting 17 tons of iron per hour. The works are located alongside the Erie Railroad Company's main line, and are fully provided with switches for the proper handling of all the different materials which will be used. All the machinery will be operated by electricity, and a number of molding machines have been installed for the purpose of turning out brake-shoes, which, with the making of railroad castings, will be the principal business of the company. The officers are: W. W. Snow, president; Otis H. Cutler, secretary and general manager; E. J. Snow, treasurer.

The plant of the Lewis Foundry and Machine Co., located for the last 25 years at Tenth and Bingham streets, South Side, is to be moved to the Neville island district. This industry has assumed large proportions, and in its line of work is one of the best known in Pittsburg. John L. Lewis is the president of the company. The new plant of the concern will be erected on the south side of the Ohio river, just east of Coraopolis. The company has secured there a large tract of land suitable in every way for the purpose for which it is to be used. Not only is there room for the buildings to be erected there now, but there will be left plenty of space for expansion as the increasing business of the firm may warrant it. Plans for the new buildings are now being made and work on the erection of the structures will be started early in the spring. The enlarged plant will be provided with all the latest and most improved machinery and appliances.

Under the charter name of the Mohawk & Hudson Mfg. Company, the Eddy Valve Co., of Waterford, N. Y., have been doing business for the past 25 years, and of late years, on account of manufacturing specialties in the way of valves, hydrants, etc., have been known to the trade as the Eddy Valve Co. As the charter recently expired, it was thought desirable to incorporate under the name of Eddy Valve Co., to continue in the same line of manufacturing, the same location, the same personnel in the directors and officers, etc. The concern are one of the largest manufacturers of valves and hydrants in the United States, as well as one of the oldest. The company have facilities to manufacture valves in much larger sizes than they ever have been made, although it is not unreasonable to look for the time when valves 96 inches in clear opening, that they can produce, will be called for. Twenty years ago a 24-inch valve was considered a large one, but in these days those that have a clear opening of 48 inches are made in quite large numbers, and 60 inches are not infrequently used.

The Fort Wayne Foundry & Machine Co., formerly operated under the name of John H. Bass, will remove their Chicago works from Forty-seventh street and Wentworth avenue to a tract owned by the Chicago Junction Railway Co., west of Ashland avenue and on Forty-third street. The foundry company have arranged to lease six acres at this point for a term of 15 years. Their extensive buildings at the present location are of steel frame construction and can be taken down and moved to the new site. For many years the Bass foundry has been located on Rock Island Railroad property, and the occasion of the removal now is the demand on the part of the railroad for more space for round-houses and storage-houses. The main building of the plant is 475 feet in length. The Junction railway's tracks will furnish the new plant with switching services. The land to be occupied by the foundry plant has 653 feet frontage on Forty-third street, and is 400 feet deep. Arrangements have been made for the temporary use of a foundry plant near Hammond, Ind., while the removal is under way.

Fires.

The foundry of the White Mountain Freezer Co., at Nashua, N. H., was damaged by a recent fire.

The old Phoenix Foundry, of St. Louis, Mo., was almost totally destroyed by a fire last month.

The building of the American Bronze

Foundry Co., at Chicago, was damaged by fire February 9.

Knowlton Bros.' foundry at Camden, Me., was damaged to the extent of several thousand dollars in a recent blaze.

The foundry of the Jackson Architectural Iron Works, of New York City, together with a number of other buildings, were burned January 31.

The plant of the Totten & Hogg Iron and Steel Foundry Co., at Pittsburg, Pa., was burned February 9, the fire starting in a neighboring factory.

The Columbiana (Ohio) Pump Works was recently visited by fire, which destroyed the foundry department. The cupola is the supposed culprit.

The extensive plant of the Hardie-Tynes Foundry & Machine Co. was razed to the ground by a fire January 24, entailing a loss of about $75,000.

The machine shops and iron foundry of Fairbanks & Timme, at Appleton, Wis., were destroyed by fire January 16. The loss is estimated to be about $3,000.

A fire in the japanning department of the Tuttle & Bailey Mfg. Co., Brooklyn, N. Y., did considerable damage January 12, and extended to a portion of the foundry.

The foundry of the Union Foundry & Machine Co., Pittsburg, Pa., was entirely destroyed January 25. Quite a few patterns were burned. The loss is estimated at $18,000.

The Kingsland Mfg. Co., of St. Louis, Mo., had its foundry, together with pattern room, destroyed by fire January 19. Sparks from the cupola are supposed to have been the cause.

Fire at the E. W. Ross Co.'s plant, at Lagonda, near Springfield, Ohio, caused a loss of between $75,000 and $100,000, there being $65,000 insurance. The main structure, a four-story building, was burned to the ground, and the foundry and warehouse partly destroyed. Adjoining structures were damaged.

Personal.

W. H. Koons has been chosen to fill the position of superintendent of the Weatherly (Pa.) Foundry & Machine Co.

Alex. T. Drysdale has accepted the position of superintendent of the foundry department of the Chattanooga Steel Roofing Co., Chattanooga Tenn.

Joseph F. Moore, formerly president, and Hiram H. Decker, formerly treasurer of the Monitor Iron Works, of New York, have severed their connection with the Central Foundry Company.

John T. Rowlands has resigned as foundry foreman with S. Freeman & Sons Mfg. Co., Racine, Wis., to accept the superintendency of the Western Mall & Grey Iron Mfg. Co.'s plant, at Milwaukee, Wis.

P. L. Young, formerly manager of the Adams Machine Co., at Corinth, Miss., has been elected manager of the Mississippi Foundry & Machinery Co., Jackson, Miss. The foundry will be complete and ready for business within a short time.

F. E. Bachman, late manager of the Shenango Furnace Co., Sharpsville, Pa., has been appointed general superintendent of the furnaces of the Buffalo Union Furnace Co., who operate the Buffalo Furnace Co., the Union Iron Works and the Buffalo Charcoal Iron Co.

Mr. T. R. Hoffman has resigned as manager of the Geauga Foundry & Manufacturing Co., and accepted a position as secretary of the Degnon-McLean Contracting Company. Harry A. Post, who has been identified with the Geauga Company for a number of years, is now manager.

Frank H. Miller has withdrawn from the firm of Miller, Wagoner, Fieser & Co., of Columbus, Ohio, to devote his entire attention to the affairs of the Columbus Iron and Steel Co. The business of the firm will in the future be conducted by the firm of Fieser, Wagoner & Bentley.

James McRoberts, formerly superintendent of the American Steel Foundry Co., at Granite City, Ill., has been engaged to fill the same position with the Schickle, Harrison & Howard Iron Co., at their new plant in East St. Louis, Ill. This concern is very busy, working a double shift of molders. Theo. Shalke is foreman of the night force.

Deaths.

John Ellis, of the firm of Ellis & Openshaw, Leeds, England, died recently, aged 55.

Samuel Lund, head of the firm of Samuel Lund & Sons, Keighly, England, is dead.

Frederick Wilkes, a partner of the firm of Coe & Wilkes, foundrymen and machinists, of Painesville, Ohio, died in Jacksonville, Fla., on January 21. Mr. Wilkes built and operated the first furnace at Lowellville, Ohio.

Charles Cooper, a veteran iron manufacturer and the founder of the Cooper-Corliss Engine Works, at Mount Vernon, Ohio, died on February 8, at his home in Mount Vernon,

at the advanced age of 92 years. Mr. Cooper built the first locomotive constructed west of the Allegheny Mountains.

William H. Dwyer, treasurer of the Peninsular Stove Co., died at Detroit, Mich., on January 14. He was 38 years old and was born in Poughkeepsie, N. Y., in 1863. He had been connected with the Peninsular Stove Co. since it was organized by his father, James D. Dwyer, in 1881.

George P. Lynd, for more than 40 years connected with Ransom Stove Works, of Albany, N. Y., in the capacities of superintendent and foreman, died at Albany, N. Y., on January 30, aged 72 years. Mr. Lynd was born at Poestenkill, Rennselaer County, N. Y., on October 2, 1828.

Seth C. Jones, superintendent of the Chelmsford Foundry Co., Chelmsford, Mass., died, January 3, of pneumonia, at his home in Malden. He was born in Dorchester, Mass., 76 years ago, and had been a resident of Malden since 1856. Mr. Jones was one of the foremost citizens of Malden and served in the Common Council for some years.

Robert Gilbert, formerly of Ithaca, N. Y., died on January 28 at his old home in Abergavenny, England. Mr. Gilbert came to this country 19 years ago and settled in Ithaca. In partnership with E. O. Godfrey he conducted a foundry business in that city up to October last, when he retired from business owing to impaired health and returned to England.

William Addison Tomlinson, formerly a member of the firm of J. Tomlinson & Son, foundrymen and machinists, of Pittsburg, Pa., died of paralysis on January 13, at his home in Oakmount, aged 68 years. He was born in Pittsburg and had lived there all his life. For five years he was president of the Pittsburg Common Council, and he also served as treasurer of the Allegheny Valley Railway Co. for some years.

Charles Williams, proprietor of the Pearl River Foundry & Agricultural Works, at Jackson, Miss., died on January 14, at the age of 73 years. He was born in England and came to this country when a young man, locating at Reading Pa., where he engaged in the manufacture of textile machinery. He subsequently removed to Manayunk, Pa., and later went to the Southwest, where he was occupied with railroading and manufacturing.

Charles Jarecki, president of the Jarecki Mfg. Co., of Pittsburg and Erie, Pa., died suddenly at his home in Erie on January 26, from heart failure. Mr. Jarecki was 60 years old. The Jarecki Mfg. Co. have been established over 30 years and were founded by Henry Jarecki, a brother of the deceased, who died four years ago. Since then Mr. Jarecki had been in entire charge of the firm's business.

Edward Noyes Wickes, vice-president of Wickes Bros., foundrymen and machinists, at Saginaw, Mich., died January 13 at his home in Saginaw, at the age of 65 years. He was born in Starkey, Yates County, N. Y., and in 1854 became associated in the foundry business with his brother, H. D. Wickes, at Flint, Mich., in the firm of H. W. Wood & Co. In 1865 the concern removed to Saginaw, and a few years later, on the retirement of Mr. Wood, the title was changed to that of Wickes Bros.

William T. Koken, president of the Koken Realty Co., and formerly president of the Koken Iron Works, St. Louis, died suddenly January 3. Mr. Koken was 50 years old. All of his life was passed in St. Louis. In 1870 the firm of Scherpe, Koken & Graden were formed. They were succeeded by the Scherpe & Koken Architectural Iron Works, and in 1892 became the Koken Iron Works. He made a fortune in the business, and about a year ago disposed of his interest in the Koken Iron Works.

William T. Porter, president of the J. Morton Poole Company, manufacturers of machinery, at Wilmington, Del., died on January 21, at his home in that city, from heart disease, at the age of 72 years. Mr. Porter was a native of Beaufort, S. C. He went to Wilmington when 15 years of age, and obtained a job in the machine shop of J. Morton Poole. He gradually became familiar with every branch of the business and rose step by step, until on the death of Mr. Poole several years ago, he was made president of the concern. When still a youth, he had an arm cut off by a rapidly revolving machine. For many years Mr. Porter was president of the Water Commission at Wilmington, and he always took an active interest in city affairs. He was a close student of scientific subjects, and kept himself well posted on modern developments in many fields of knowledge.

Otto W. Meysenburg, president of the Rodger Ballast Car Co., president of the Siemens-Halske Electrical Co., of America, and former president of the Wells-French Car Mfg. Co., died February 11, at Alma, Cal. The cause of death was typhoid fever. He was 52 years old.

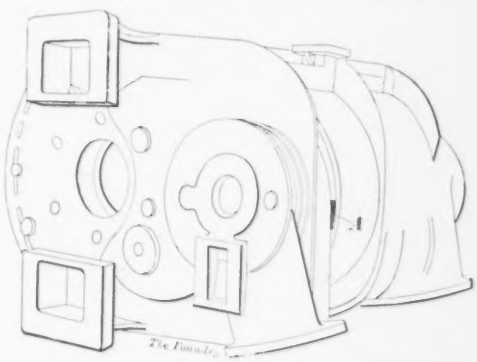
Mr. Mysenburg came to St. Louis from Germany when a boy. He came to Chicago in 1886. At the time of the World's Fair the big Siemens-Halske Company of Germany established an American branch in Chicago, and Mr. Meysenburg was made president. He purchased the Grant Locomotive Works, and engaged in the business of manufacturing electrical machinery. He was made president of the Wells-French Car Mfg. Co., which sold out in March, 1899, to the American Car & Foundry Co. Since then he has not been engaged in any active work, although still president of the Rodger Ballast Car Co.

The Burning or Mending of Castings.*

It has often been questioned whether it was advisable to burn castings which are broken or have proved defective, even after a great deal of expense had been put upon them, and when one begins to theorize upon the matter, the natural conclusion derived is that it is impossible to mend a casting by burning. When we get to practice, however, we find that the reverse is the case, and I have burned castings which were considered by many founders to be hopeless. For instance, in making a marine cylinder, a piece was broken from a sharp point of the exhaust core which the coremakers had not secured fast enough, and this caused a hole to be left clear through to the outside of the casting, as is shown by A in the accompanying cut.

The procedure that we adopted was based upon the laws which govern expansion and contraction as nearly as possible. We put the casting upon a car with the defective side uppermost, and made loam molds to cover this, also a loam mold to fit the inside of the casting at the same place. Then we took back the molds, dressed them up and gave them a coat of blacking, dried them thoroughly, put them back to their places, and secured them tightly to the casting. We then made a runner to take off the metal poured upon the casting, the overflow of which was caught in another ladle placed for the purpose. After all the arrangements had been completed the whole thing was put into the oven, which is a very important matter, as you must get the casting as well warmed as possible, for this is where the success or failure in burning comes in.

It is essential to have a casting to be treated in this way heated up to at least 600 degrees F., and this can easily be accomplished. After an oven is thoroughly heated with the usual coke fire, about one hour and one-half before you have the metal ready for burning, fill the fire in the oven with soft wood, and continue doing so until ready. This will raise the temperature to the desired point. In order to assure yourself that the oven is hot enough you can put a piece of lead upon the car; if it melts you may be certain that you have the temperature high enough—lead melting at 612 degrees F. You could also place a piece of tin on the car, as it melts at 442 degrees, and by doing so you will be able to determine very nearly to what temperature your oven has been heated. When everything was ready in the case under discussion the car was pulled out of the oven. The metal, good and hot, was poured into the mold prepared upon the casting, enough being used to melt the casting about one inch on either side of the defective part.



Dry charcoal blacking was used to cover the cast, and then the whole thing was run back into the oven and let cool gradually.

I have now burned a number of large castings on this principle, and have been successful in every instance. The iron used for this purpose should be of the very softest nature, so as to keep down the shrinkage, and make it easy for machining and chipping.

There are many castings which can be easily burned without being brought up to this excessive heat, such as when you have to mend on some extreme point, where undue expansion and contraction will not matter. We once had occasion to burn the casing of a centrifugal pump which got broken right across the casting. This was burned very successfully without preliminary heating, but even in this case it would have been advisable to heat the casting, as it would have facilitated the running of the metal. I have seen castings of this

*Paper read before the Foundrymen's Association.

description burned cold, and as soon as the metal touched the cold iron it was chilled, and the consequence was a failure. The result was that the pieces were thrown away, and this only on account of an insufficient knowledge of the best methods in the art of burning and mending of castings.

Some founders in burning castings make a practice of bringing the metal forward in small ladles, with the idea of bringing it very hot in this way. This is a mistake, as you can put it all into one ladle and by having a large quantity it will hold its high temperature for a longer period. When you pour you can maintain a good, steady stream upon the part, besides reducing the extra expense of additional help in handling so many ladles.

In burning the neck on rolls, it is much better to adopt the principle of making a loam mold, leaving a hole at the bottom so as to run off the metal until the roll is melted. After the mold is prepared, finish and dry it, then secure it to the casting and build a good hot fire around the casting at the part to be repaired until it is a bright red. Now pour very hot iron into the mold and allow it to flow off until the casting is melted. This can easily be determined by trying it with a feeling rod, and when satisfied stop the exit of the metal and fill the mold to the required height. You can also burn a steel face on to a hammer die on the same principle, but it is not necessary to heat the steel as the iron melts it very rapidly.

The question is often asked, "Is the casting as strong after being burned as it was previous to being broken?" In a great many instances it is stronger, as very often there is a contraction strain upon the casting which has been relieved by the breaking, and when properly mended it should be certainly as strong.

EDWARD B. GILMOUR.

Cast Iron Wheels for Heavy Coal Cars.

Present experience with coal and ore cars of large capacity seems to indicate that the limit of the cast iron wheel has been reached, unless a change in form is made or the wheel flanges are in some way relieved in service. The breakage of wheels, and particularly of flanges, under 50-ton cars, has created a great deal of anxiety of late, and the question of the necessity of steel tired wheels for this service is now seriously raised. It has been said that the cars are too heavy and that there will be a general reduction from 50 tons to 40 tons as the maximum capacity. This probably will not be done as long as railroad managements are able to obtain the benefits of 50-ton loads in one or both directions in cars making an average of 2,000 to 2,600 total miles per month, which is now being done. There seems to be no question of the firm establishment of the 50-ton car, and the wheels must be made to carry them. Cast iron wheels for these cars have been strengthened at the hub to the point of withstanding a wheel press pressure of 110 tons upon a mandrel, and they have, in at least one case, been increased in weight to 690 pounds for the purpose of overcoming breakages in the plates, but the breakage of flanges is not so easy to stop. The opinion that the limit of strength of the flanges of cast iron wheels of the present standard contour has been reached is growing among those having the widest experience with these cars. It seems to be necessary to increase the thickness of the flange as it stood before 1894, or to take up the steel tired wheel. Perhaps ⅛ inch more metal in the thickness of the flange will be enough. It is, of course, desirable on account of the low cost to make the cast iron wheel strong enough, and efforts will be made in that direction. This question will undoubtedly receive attention at the convention next summer, but instead of being confined to engine trucks, the relative safety of the two types of wheels need to be considered also from the standpoint of cars. Several broken flanges coming to our notice had blue fractures showing the influence of the brakes on mountain grades. This is troublesome in the East as well as in the West. It is evident that the near approach to 75 tons of car and load brings up new factors in the matter of wheels. It occurs to us that perhaps the general use of rigid trucks has a bearing upon the flange breakage, and the suggestion of a return to the swing motion truck for such heavy cars seems to be a reasonable one. It would undoubtedly serve to reduce the shocks to which rigid trucks must necessarily subject the wheel flanges.—*American Engineer and Railroad Journal.*

Jacking up the Citizens.

Greenfield can have a good foundry if her people will only give the movement a little encouragement. It will pay to do so. Greenfield could compete with Connersville and Noblesville in the manufacture of buggies if some of her citizens only had a little more nerve and enterprise.—Greenfield (Ind.) Republican.

1901 Convention of The American Foundrymen's Association.

The sixth annual convention of this Association will be held in Buffalo, N. Y., June 4, 5 and 6, and the foundrymen of that city have promised to do their best towards interesting visitors during this period. The following committees are announced:

Committee on Finance and Entertainment—Chairman, O. P. Letchworth, Pratt & Letchworth Co.; E. C. Lufkin, Snow Steam Pump Co., Buffalo, and Holly Mfg. Co., Lockport, N. Y.; W. Perry Taylor, Bingham & Taylor; P. H. Griffin, New York Car Wheel Co.; Lyman Hubbell, Fillmore Avenue Foundry; C. M. Farrar, Farrar & Trefts, East Buffalo Iron Works; C. C. Bolton, M. A. Hanna & Co., Cleveland; C. M. Greiner, Buffalo Pitts Co.; W. A. Rogers, Rogers, Brown & Co.; Gibson Howard, Howard Iron Works; Van Loan Whitehead, Whitehead Bros. Co.; Frank B. Baird, Buffalo Union Furnace Co.; Jas. S. Kingsland, Buffalo Foundry Supply Co.; Chas. M. Helmer, Hall & Sons; Geo. D. Hayes, U. S. Cast Iron Pipe & Foundry Co.; F. H. Stevens, Brooks Locomotive Works, Dunkirk, N. Y.; E. P. Seldon, Erie City Iron Works, Erie, Pa.; Geo. Linnen, Buffalo Scale Co.; Henry Bond, American Radiator Co.; E. C. Shafer, American School Furniture Co.; H. H. Hewitt, Magnus Metal Co.; E. C. McCarthy, Beals & Co.; E. C. Neal, Weed & Co.

Committee on Reception.—Chairman, Henry W. Wendt, Buffalo Forge Co.; Geo. M. Trefts, Farrar & Trefts, East Buffalo Iron Works; Lawrence Ginther, J. Ginther's Sons; Jas. J. Lawler, Lawler Iron Works; Albert Hoppin, Edward P. Allis Co.; Chas. F. Bingham, Bingham & Taylor; Robt. Hickok, H. G. Trout & Co.; R. K. Noye, Jno. T. Noye Mfg. Co.; H. S. Madden, Howard Iron Works; Geo. A. Lautz, Niagara Michine & Tool Works; Chas. F. Dunbar, The Buffalo Foundry Co.; W. C. Houck, Pratt & Letchworth Co.; J. C. Bradley, The Pratt & Letchworth Co.; E. G. Felthousen, Acme Malleable Iron Co.; T. J. O'Brien; J. H. Ludwig, Buffalo Co-operative Stove Co.; Nathanial Jewett, S. S. Jewett & Co.; Jno. Dobbie, Dobbie Foundry & Machine Co., Niagara Falls, N. Y.; D. A. Hixson, Gardner Foundry Co., Lockport, N. Y.; Josiah Ross; Jno. W. Pohlman, Broadway Foundry Co.; Henry M. Brown, Brown Car Wheel Co.; Orrin Bryant, Bryant Iron Works; Henry R. Clark, Clark Mfg. Co.; Robt. S. Cox, American Car & Foundry Co.; J. O. Gould, Gould Coupler Co., Depew, N. Y.; Samuel S. Baird, S. H. Baird & Co.; Chas. G. Shepard.

Press Committee.—Chairman, S. W. Spear, East Buffalo Iron Works, secretary Buffalo Foundrymen's Association; W. F. Wendt, Buffalo Forge Co.; Dr. Richard Moldenke, secretary American Foundrymen's Association, Box 432 New York City; J. A. Penton, secretary National Founder's Association, Detroit; Gibson Howard, Howard Iron Works; Chas. Kirchoff, *The Iron Age*, New York City; B. M. Gardner, *The Iron Trade Review*, Chicago.

Casting a Six-Way Pipe Without a Pattern.

There are foundries throughout the country that have often turned away jobs similar to the one that is the subject of this article for no other reason than that there were not brains enough in their whole concern to invent a "rig" or make the job without patterns. There are, of course, many specialty shops that it would not pay to handle such things; but there is no excuse for the jobbing shop that advertises to do

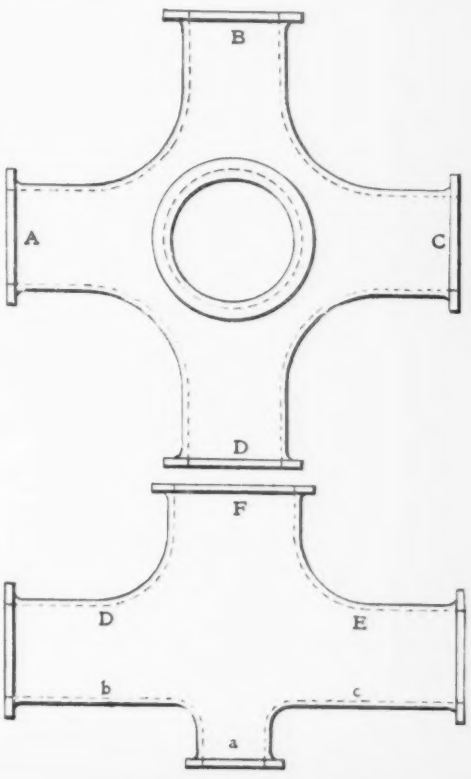


FIG. 1. THE PIPE TO BE MADE.

all kinds of work to turn a customer away with a job that a good price can be gotten for.

Fig. 1 shows the six-way pipe about to be made, and aside from a pile of bricks the first things that come under consideration

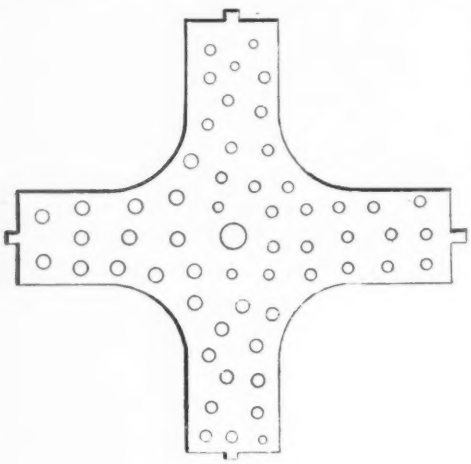


FIG. 2.

are the "irons." The pipe was 8 feet long, the four horizontal branches 26 inches diameter, the upper branch larger than this and the lower one considerably smaller. The sketch is not made to any scale.

We will make the core first and use that for a pattern. Fig. 2 is a core-plate the full size of casting, with core bearings at the ends. The reason for making it so is that after the core is swept up a bearing will be all around the core so as to hold the thicknesses that are put on. Then comes the core arbor, shown in Fig. 3 with section of one

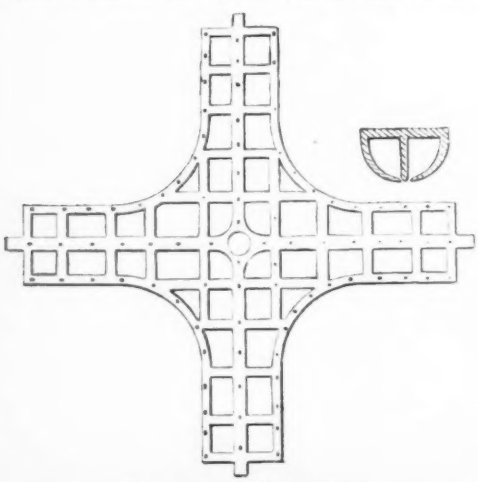


FIG. 3. THE CORE ARBOR.

arm. These are, as are all the rest of the rig, cast in open sand, and no pattern of any kind is required aside from the horn to form the semi-circular prongs on the core arbor. Two of these arbors will be required, one for the bottom half with lifting lugs on, as shown and one for the top half without lifting lugs. Care should be taken to have the center prickers strong enough to carry the bottom branch a, or many would make a separate arbor and bolt it to the main "iron." The bottom plate is best made as shown in Fig. 4, although a round plate as outlined, or, for that matter, any other shaped plate big and strong enough would answer the purpose. There would, however, be waste of metal, and if the mold was built

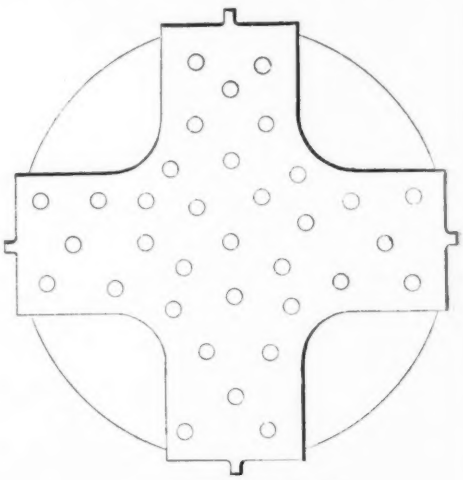


FIG. 4. BOTTOM PLATE.

circular to conform to it, it would be too hard to dry, and there should be a waste of fuel as well as metal. The mold could be built on the round plate to conform to the outline of the mold, and a cope-plate as the one shown in Fig. 5 used. If a whole new rig is to be made, the bottom plate shown in Fig. 4 is the best and most convenient. All such plates as Figs. 2 and 4 should have plenty of holes cast in them to facilitate drying, and where the spindle is to be used a hole large enough in the center. Have some half flanges cut, as shown at A, Fig. 5, two fillet sweeps B and C, three sweeps, Fig. 6, and one whole flange, half of which is shown at D, Fig. 5, cut on lines so as to allow it to draw in easily when part X is first drawn. With four rough 1-inch plates to cover the top of the building, a small top plate to cover the part F, two gate sticks A, Fig. 7,

and four riser sticks, we have about everything required.

The bottom half of core a b c, Fig. 1, must be first made, and we set core-plate, Fig. 2, in position, taking care to have it level, and the hole in the center perpendicular to spindle seat. Spread on the outer edges a good inch of loam and put on the core arbor, taking care also that while having it evenly set the center hole corresponds with the hole in the plate over the spindle seat. See that no prongs are too long by going over the arbor with one of the half flanges, eight halves of which are required. Build the four prints in arch form with whole bricks. Lay two or three rows of half bricks around the outer edge of the arbor to conform to the shape of the inside of the flange,

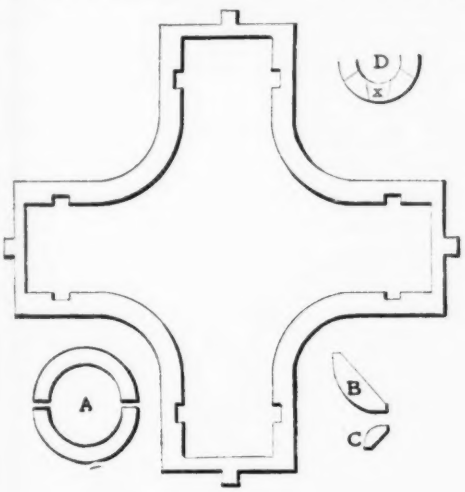


FIG. 5.

and then fill up the body of the core with cinders. Secure the spindle and attach sweep A, Fig. 6, and build part A, Fig. 1, of half bricks. Loam the straight part of it, and the rest of the core can be made up of core sand. The flange will strike off the straight parts, and the piece C, Fig. 5, will be a guide on the turns. B will be used on the top side. After the core is well finished up set the flanges in their proper places and put some spikes outside them on the prints to hold them. They can be set accurately from the spindle, but it does not cost much to make a template, which would be a square with the center lines marked on it (Fig. 7), and it is best to have it. There is not a piece in the whole thing that a good molder cannot make himself.

When the flanges are secured and the core properly slicked up, get a square or oblong corebox (6x9 inches makes a nice handy size) and of the proper depth (in this case ¾ inch), and with some good, tough new mold-

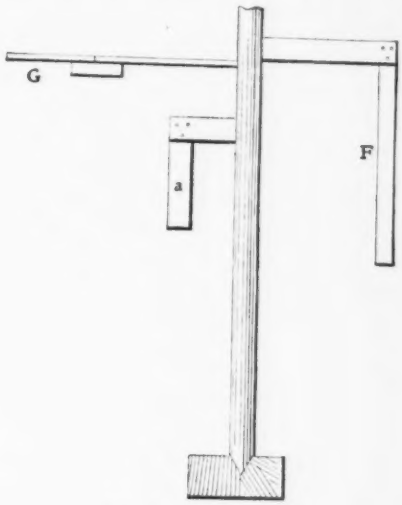


FIG. 6. THE SWEEPS.

ing sand well moistened make some cake cores in the box. Turn them out on a flat board and lay against the core and drive in some small nails to hold them; as, if this is not done they will fall off when the core is turned over. After the core is all covered with these thickness pieces put on a coat of slip and slick up nice and smooth; take off

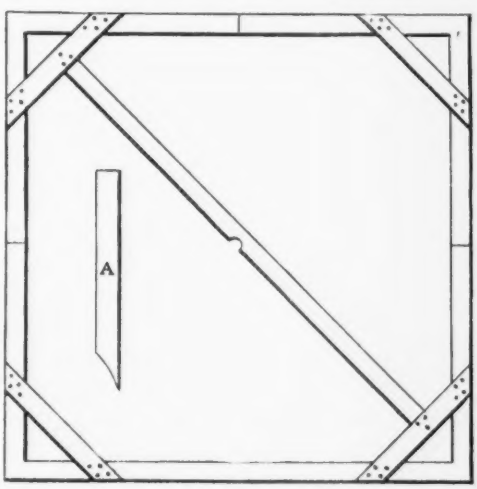


FIG. 7. TEMPLATE FOR SETTING FLANGES.

the flanges, and the core is ready for the oven. The bottom plate, Fig. 4, can now be set in position, care being taken to get the

center hole right, as in the previous cases. Build four piers at A, B, C, D, Fig. 1, and sweep them level with an arm from the spindle. As the four prints of the core must rest on these piers, it is easily seen how necessary is to have them perfectly level,

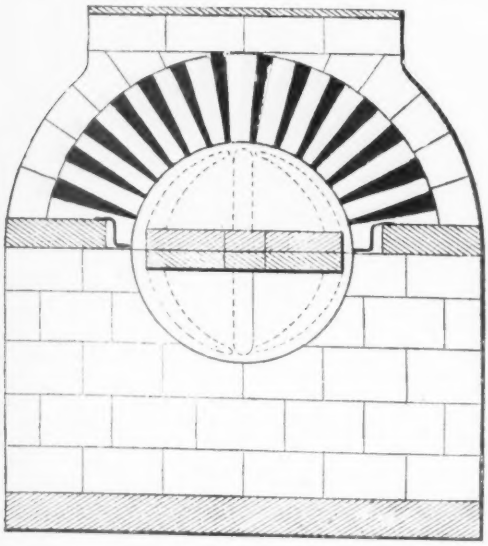


FIG. 8. END OF MOLD.

and high enough to allow at least one brick and an inch of loam on the bottom under the branch A. When the half core is dry, it can be turned over with the cross or beam and slings and set on the piers. The best thing then to do is to put on the other arbor and clamp it to the lower one securely, after which build the top half in just the same manner as the bottom half.

Oil the surface of the bottom of the core, as well as the flanges, rub on some parting sand, and commence building under the core, continuing until the center is reached, where a parting is made and the cope-plate, Fig. 5, put on. Arch over the whole with bricks and loam in a reliable manner and from about the point shown in end view, Fig. 8, build square. Set the gate pins on the most convenient flange down far enough to prevent the iron in pouring from falling directly on the core, and put a riser on each flange. Build the mold in circular form around and top branch and sweep the flange with sweep G, Fig. 6. The mold is then built, and before lifting off the cope place a round plate on top of the top branch of the core and run a long bolt down through the hole where the spindle came out, and secure it to the bottom plate. This will prevent the top branch of the core from being broken or lifted away in the act of lifting off the cope. When the cope is lifted off it can be set on four stools, the ¾-inch thickness of sand scraped off, and finished "overhead." The core can be lifted out of the bottom half and all finished separately. When properly finished dry well in the oven, and the rest will be easy.—Jas. A. Murphy in American Machinist.

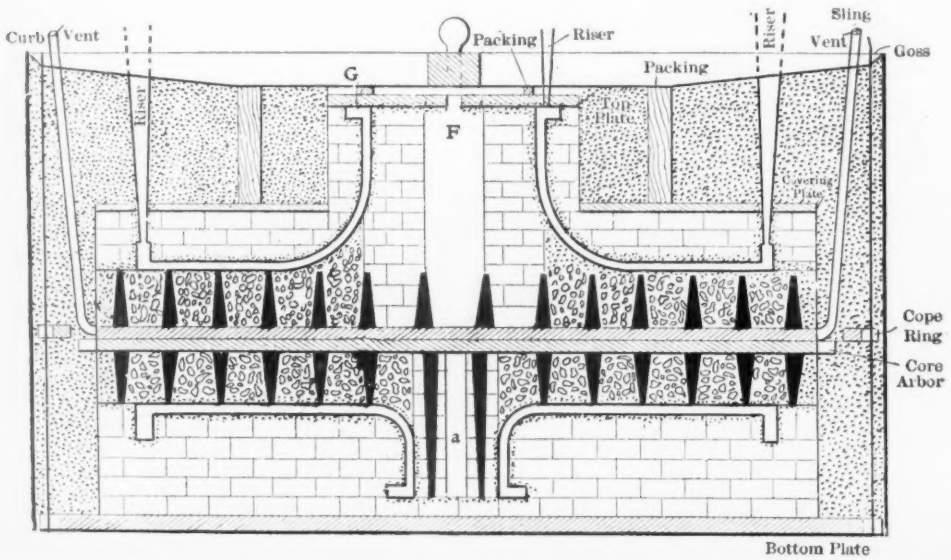


FIG. 9. VERTICAL LONGITUDINAL SECTION OF MOLD.

College Bred Men.

Men are said to be born to command, and others born to follow. The college-bred young man generally imagines that he is one of those born to command when placed in charge of men; and this is wherein he fails.

Recently, while visiting a large malleable iron foundry plant, for the purpose of looking over their cupolas and plan of mixing and melting iron, I was surprised to learn that they did not employ a chemist at their works, and inquired of one of the firm why they did not do so. He said: "Our experience in employing college-bred young men in our works has not been very satisfactory. When we constructed this plant a few years ago we employed a young civil engineer, who was highly recommended, to lay out the works, make drawings for the various buildings, place machinery, cupolas, furnaces, etc.

"His work in this line was very satisfactory, and he showed such a thorough technical knowledge of foundry practice, in laying out the plant, that after he was through with this work, we decided to continue him in our employ, by giving him charge of the foundry.

"He had not held this position for more than two weeks before he had quarreled with or offended nearly every man in the foundry, and almost every man in the foundry was opposed to him. We could not get satisfactory results with this condition of affairs existing in our foundry, and had to let him go, and placed one of our molders in charge who was more familiar with the ways and ideas of the men and more capable of managing them than the man with the college education.

"This should not have been the case, if there is anything in a scientific education, and would not have been the case had not the college-trained man thought himself superior to the mechanics and laborers placed in his charge, and treated them as mere mechanics or trash to do his bidding. This is only too frequently the case with young men educated at colleges when they engage in mechanical pursuits.

"They think mechanics uneducated men, inferior to themselves, which is not the case; for, while he has spent three or four years at college, the mechanic has spent a similar length of time learning his trade, and knows more about it in a practical way than does the college man, who has only gained a theoretical knowledge of mechanical pursuits at college.

"The mechanic knows this, and is ready to resent any action of the college man which tends to assert his superiority as a man or a mechanic."

The young man above referred to is not the only college man learned of having been a failure in managing men, and I might give the experience of quite a number of manufacturers in this line. But I have only met one college-bred man who started in with wrong ideas in the management of men that ever made a success of managing them in the works in which he started. This man was a stove founder at Boston, Mass. And it was amusing to hear him tell of his experience before, as he expressed it, he took a "tumble to himself," and in place of thinking the men ignorant fools he discovered he himself was the fool. And had it not been for his father's interest in the works of which he afterwards became owner he would have been kicked into the street both by the men and his employer. "Why," said he, "I thought the men did not know anything, and were a set of fools, and it took me several years to learn my mistake, and several years more to get back where I would have been at the start had I learned at college what I afterwards learned by experience about human nature and the management of men."

The manager or foreman who quarrels with or curses and swears at men, or yells at them across the shop, and orders them what to do in the presence of other workmen, is seldom a successful manager or foreman; for such actions are regarded as humiliating by the man spoken to, and arouse a spirit of resentment which is made manifest in a variety of ways against the manager or foreman to the injury of their employers.

Each workman has his friends among his fellow workmen who sympathize and side with him against such treatment. No matter how much the workman reprimanded may have deserved to be reprimanded, these join with him in getting even with the manager or foreman, and such treatment of men generally results in a general dissatisfaction of workmen, and is sometimes the cause of men quitting at a time when they know their services are most urgently needed, or

of strikes, resulting in great loss to their employers and themselves.

The successful manager or foreman is the man who thoroughly understands the mechanical pursuits in which he is engaged, and has acquired the nack or science of not driving, but leading men to do his bidding. Such a man does not quarrel with his men or do anything to humiliate them in the presence of his fellow workmen.

When their work or conduct is not satisfactory he goes quietly to the workmen and advises or instructs them what to do to improve matters and make affairs satisfactory.

If such instructions or advice are not followed, or the workman is not competent to do the work, he is quietly informed on pay day that his services are no longer required, or is given his time and sent to the office.

The disturbing element among workmen, of which there are always a greater or less number in every workshop, are treated in the same way, and everything is done to avoid offending the men and creating a spirit of dissatisfaction among them, which always results in loss to their employers.

The class of men employed in mechanical pursuits, whether mechanics or laborers, are an intelligent class of men, in their line, and like all intelligent men, object to being driven; and while the driving foreman may be a success in handling a gang of ignorant foreign laborers, building a railroad or digging a ditch, he is never a success financially in mechanical pursuits.

The foundry chemist, which I have been advocating as the proper man to be placed in charge of cupolas, and the mixing and melting of irons, should carefully study these points, and should ever remember that every workman, no matter how humble, has his feelings and his friends; and that it is more profitable to lead than to drive, and that when men cannot be led they cannot be driven, and that there are other remedies than quarreling with them. The following rules may lead to the successful management of men in mechanical pursuits if the man has the ability to be a manager:

1. Learn to control your temper under all circumstances.

2. Cultivate a manner of address that will win the respect of the highest or lowest of workmen.

3. Be firm and polite in demeanor, and an ardent student of human nature, that you may win the respect of all men.

4. Cultivate executive ability, and never give up until you have accomplished the end in view.

5. Be sure you are right before you go ahead; it is better to abandon a theory or hobby than to make a failure of it.

6. Be temperate in habits and language.

7. Treat all workmen under your charge with due respect in and out of the shop; but never make companions of them, either out of or in the shop.

8. Always remember that you do not know it all, and cultivate the habit of learning from workmen under your charge, and others, all you can without exposing your own ignorance.

9. Learn to apply such knowledge without giving others credit, and to improve upon it or present it in such a way that the man from whom you obtained the knowledge would not recognize it as his own, and give you credit for knowing more than he did.

10. Never quote one workman to another as authority for anything you want done; be the only authority in the shop yourself.

11. Never try to instruct a workman how to do a job you do not know anything about; first find out if the workman knows how to do the job, and if he does not, give it to another who does, and learn from him how it is done, so you may be able to instruct another.

12. Strive to get the largest possible amount of work done, and well done, by each man, and look after the interest of your employers in all things, for you are employed to make money for your employers, and if you cannot do it, they will not require your services very long.—Edward Kirk in American Manufacturer.

Electric Traveling Cranes.

In the discussion of Mr. Williams' paper of this title before the Pittsburg Foundrymen's Association, Mr. S. D. Sleeth stated that the subject of electric cranes was an important one, as they were coming into very general use. Part of their popularity is due to the fact that electric plants in connection with manufacturing establishments are becoming very common in order to supply light and often power also for running various kinds of machinery. The electric plant being necessary in any case, it is natural to extend

its usefulness by employing one or more electric traveling cranes. Mr. J. S. Seaman brought up the subject of brakes for the bridge travel and asked Mr. Williams to give what points he could on the subject. Mr. Williams stated that there were various forms which could be readily applied and would stop the bridge, but the difficulty was that, including the load being carried, there was a very heavy weight to be stopped, and the bridge was likely to slide. It is perhaps preferable to stop the bridge in an emergency by reversing the motor. Mr. Seaman stated that he employed a 60-ton crane, which frequently carried a load of from 30 to 35 tons, and it was a pretty dangerous matter to stop it quickly. Mr. Williams pointed out that the existence of the brake was likely to make the operator careless. He uses it too much and gets to depend on it in cases where it is not absolutely needed. He knew of one case where a 60-ton crane had been equipped with a brake, which was subsequently taken off as it was considered dangerous. There was no trouble without it, as the operator ran the crane at a slower speed. He thought it better to have no bridge brake on cranes of over say 25 or 30 tons' capacity.

An accident was mentioned as having happened to a crane equipped with a bridge brake, on account of the sidewise pull of the load, which caused the chain to lap on the drum and rub the motor, spoiling it. The crane maker was hardly to blame for the close quarters in this case, because he was continually between the devil and the deep sea, through his desire on the one part to design the machinery so it will run most satisfactorily and give least trouble, and the desire of the customer on the other hand for a maximum of floor space. The latter result in a crowding of the machinery into too small a space. It was mentioned that broken sheaves or a bent shaft frequently resulted from running the hook up too far and catching it in the shaft.

Regarding the recommendation in the paper that the chain be annealed at intervals, Dr. Moldenke inquired how often it was desirable to anneal the chains, and Mr. Williams stated that ordinarily the chains should be annealed once a year, but with heavy service day and night once every six months was by no means too often. The hook should also be annealed, but care should be taken not to get it too hot, as this would be worse than not annealing at all. Dr. Moldenke stated that a good red heat should be right, with very slow cooling afterward. It was important to get a temperature just right. He knew of some pins that had been annealed to 1425°, which was not enough, and they had been annealed to 1450°, which had been found to be all right, the 25° making all the difference in the world.

Cases were cited of the flanges breaking off the wheels on the same runway, this being caused by the wheels not being all the same size. The wheels are made with a chilled tread, to keep down the wear. In a long runway, say 200', a very slight difference in the diameter of the wheels is likely to cause trouble. One of the members, speaking of calipering the wheels to see that they were all the same diameter, it was pointed out that measurement by a steel tape was much preferable. This was not because the steel tape was more accurate in itself, although it is true that the measurement by the steel tape is easier than with the caliper, on account of the care required to have the caliper in the right position, but because it is the circumference of the wheels that should coincide rather than their diameters, the circumference determining the amount of travel per revolution. A wheel might be slightly elliptical and yet work well enough, while one measurement with the caliper would show nothing with respect to this wheel, since it might be made on the major axis of the ellipse, or on the minor axis, and these would be different.

Cast Iron.

Cast iron is a compound of iron and metalloids, the exact number or nature of which, has not yet been fully determined. It is not my purpose to treat of the various metalloids or their effect upon iron, but, to treat of the compound as a whole, in its application to the art of founding.

Metalloids are found in combination with iron in its native state, and may be added to it when smelted in a furnace, from fuel, fluxes, etc. They give to iron the various characteristics found in cast iron, such as hardness, softness, weakness, strength, chilling tendency, etc. When a casting is to be made, it is the practice of founders to select an iron containing metalloids that give to the iron the requisite qualities required in the casting. When such iron is not obtainable, it is the practice to mix two or more

irons that the metalloids, when blended together in melting, may produce an iron having the qualities required for the casting.

As all founders are not familiar with the term metalloids, I will endeavor to state the matter in more familiar foundry terms. When a casting is to be made, an iron is selected having the qualities required in the casting, as indicated by fracture, or previous experience in melting the iron. When such an iron is not at hand, a mixture of two or more brands of pig Nos. 1, 2 and 3, or a mixture of pig and scrap, is made to produce, when melted together, an iron having the desired qualities. To produce such an iron from one or more irons, it is necessary that the metalloids or elements, that give to the iron or irons their characteristics, shall be retained in the iron, after it is cast. If this is not done, then analysis, indications of fracture, or previous experience with the iron, is useless as an indicator of results, and this can only be done by the proper melting and casting of the iron.

The metalloids or impurities, as they have long been called, are removed from cast iron by a high degree of heat, as illustrated in the making of steel by the Bessemer process, and are also removed by prolonged degree of heat, just above the melting-point, and agitation of the metal, as illustrated in the puddling of iron, in the manufacture of wrought iron. With the high degree of heat, we have nothing to do when melting iron in a cupola furnace, for the highest degree of heat obtainable in such a furnace is not sufficient to remove from cast iron any of the metalloids that effect the character of the iron. It is the low degree of heat, as illustrated in the puddling furnace, we have to deal with.

The puddling furnace is a reverberatory furnace, and in it iron is not melted in contact with the fuel, but is melted by the flame from the fuel being passed over the iron by a forced blast or draught of a high stack. The metalloids are removed from the iron by the flame to some extent, when the iron is being melted, and fully removed by stirring or puddling the iron when in a semi-fluid state, and exposing every part of it to the flame.

In a cupola, iron to be melted is placed in direct contact with the fuel, and is melted with a forced blast. The blast, after being forced into the cupola through the tuyeres, is heated by the fuel in the bottom of the cupola, and at a certain point in a cupola enters fully into combination with the carbon of the fuel, and produces an intense white heat without a flame. This point in a cupola is known as the melting point or zone; above this zone a flame is produced from the fuel by the heat. This flame removes metalloids from iron upon the same principle and to a similar extent, to that of a puddling furnace when iron is melting, and when iron is subjected to it for any length of time in melting, metalloids may be removed to a sufficient extent to entirely change the character of the iron.

Iron is subjected to this flame by the use of an excessive amount of fuel, which places it above the melting zone and supports it there until the fuel is consumed, and permits it to descend into the zone. The length of time iron may be subjected to this flame depends upon the excess of fuel used and the kind of fuel. When melting with anthracite coal we have seen iron supported above the melting zone for from half an hour to an hour in the flame, and from two to three hours in a cupola, before descending into the flame or zone. All this time it was being heated, and when it descended into the flame was heated to a sufficient extent to be readily effected by the flame.

Iron, when subjected to the flame in a cupola, is slowly melted from the outside, and every part of it is exposed to the flames as it melts away. That metalloids are removed from iron when melted in this way, there is no doubt, for we have seen a mixture of soft Scotch pig and No. 1 soft American iron run too hard for the work to be cast, when melted high in a cupola, and the same iron run too soft and kishy for the work when a proper amount of fuel is used, and the iron quickly melted in the melting zone, and scrap had to be added to the mixture to give the castings a proper degree of hardness and strength.

To retain the metalloids, and obtain an iron having as near as possible the characteristics of the iron before melting, the iron should be melted rapidly and hot in the melting zone. This can only be done by the use of a proper amount of fuel for the bed and charges, and placing the exact weight of iron on the bed and charges that will melt hot and fast. No two cupolas melt exactly alike, and the amount of fuel to be placed in a bed and in the charge must be learned by experiment, and the amount of

iron that can be melted on the bed and charges found in the same way.

After having melted iron in a way that will prevent metalloids being removed in melting, the next important matter to be considered is the best means of retaining them in the iron; evenly distributed through it when the iron is cooled again. This can only be done by a proper handling of the iron when in a molten state.

When we draw from the cupola a ladle of iron at a white heat, the metalloids are in combination with the iron, and the surface of the iron in the ladle is as clear as crystal; no dirt or dross is found upon it, save that which may be washed from the spout by the stream or was in the ladle before filling it. If we permit this iron to remain in the ladle until it sets, as its temperature is reduced a scum collects on the surface and pieces of dirt or dross may be seen to rise to the surface as long as the metal remains in a fluid state. And the greater the length of time the iron is in cooling from a molten to a sold state the larger the amount of dirt and scum that collects on the surface. This dross and dirt is the metalloids that have separated from the iron in cooling, and the amount of dross is greatly increased by stirring or agitating the iron while cooling. To prevent the separation of metalloids, the iron should be changed from a molten to a solid state as rapidly as possible, and without being agitated while changing from one state to the other.

This may be done by taking the iron direct from the cupola to the mold, and pouring it into the mold at the highest possible temperature. The iron then reaches its ultimate destination at a high temperature, and is placed in a condition to be cooled rapidly without being disturbed when changing from a molten to a solid state. The metalloids have not the opportunity to separate they have when the iron is reduced to a semi-fluid state in a ladle before pouring, and a strong, clean, even iron is obtained in the casting.

On the other hand, if we melt the iron dull, or cool it in a ladle before pouring, the metalloids separate to a greater or less extent, and when the iron is poured they collect in spots, and a dirty casting is produced from the same iron that a clean casting may be made from if the iron were poured hot.—Edward Kirk, in American Manufacturer.

Problems of Heat Treatment.

The increasing appreciation of heat conditions has been the means of clearing away the confusion of doubts and surmises, which have for many years attached themselves to all casting operations. Heat and its equivalents which are embodied in pig metal are the nucleus of all possibilities contained therein. The caloric condition of blast furnace determines the grade of the product, and it matters not how carefully a theory for the burden may have been worked out, if the temperatures vary the calculation will be destroyed, for the metal will be influenced according to th amount of heat present.

There are many causes for an irregular working in stack, and the composition of burden is one of the least, for when fuel and atmospheric conditions are favorable, it is just as possible to produce a rich iron from a lean burden as it is from a rich one. After the iron has been cast, the conditions existing in blast furnace during casting will be reproduced in the metal and will be represented by the presence of several metalloids which are unquestionably dependent upon such conditions, for their appearance in the certain percentages which from an analytical standpoint determines one grade from another.

Therefore, the chemical composition and grading fracture is again the direct consequence of heat manipulation. The heat of furnace when iron is tapped will be shown in the percentages of silicon and graphitic carbon present in the metal. A No. 1 iron with a high silicon and graphitic carbon content, will be a "hot" metal, and the No. 5, with low silicon and carbon, will be a "cold" iron, and there is no deviation from this rule irrespective of variance in practice.

The No. 1 iron may be remelted and refined at a lower temperature and be hotter, retaining fluidity longer than the No. 5 iron, which requires a higher temperature to melt, and when taken away from heat influence loses its fluidity and chills at once. Silicon and graphitic carbon are always present in ratio. The amount of graphite present is entirely dependent upon the percentage of silicon. It would be quite impossible in regular working, to have an iron with 4 per cent of silicon, and no graphitic carbon, and the reverse, 4 per cent graphite and no silicon.

Curiously enough, sulphur is also the pro-

duct of heat working; it has, however, no bearing upon the fluidity of metal when remelted. The No. 1 or "hot" iron will contain but very little of it, while the No. 5 or "cold" iron, will have considerable, as this latter iron when passing the fusion zone in stack is very dull, and being spongy is an absorbent of impurities in fuel and slag. The evil effects of sulphur are very prominent when iron has been refined, and when worked under the hammer or rolls we meet with the familiar "red-shortness."

Phosphorus appears to be the only metalloid which through all the variable conditions of furnace, manages to retain in a measure some proportion of its original calculation in burden. Its direct influence on metal being remelted is in turn also dependent upon the amount of heat which the metal is capable of developing. In gray iron and malleable casting it serves as a factor for fluidity. But in all grades of steel it is debarred on account of its well-known characteristic "cold-shortness."

Manganese has not, as a general rule, been as prominent in pig iron calculations as the other metalloids. Of late years the percentage has been gradually increased, hoping thereby to derive some benefit from its ability to slag off sulphur and its supposed effects upon the combination of carbon. Manganese has not, however, been recognized as a leading factor. It would appear that with careful consideration of heat conditions and their important bearing upon the chemical constitution of iron, we could derive some very beneficial knowledge which would have its bearing upon the physical status of metal. This would have more reference to the iron casting industries than steel, for in the instance of the latter no matter what may have been the original heat conditions, all the latter are eliminated and there is substituted for the original contained factors, the highest degree of artificial heat possible.

Therefore leaving steel out of the qustion for the moment, iron casting, and particularly malleable, will be considered. Malleable is produced in many ways, some entirely out of the beaten course. Yet the material has always been maintained at a very uniform quality. It may be reasoned that underlying all furnace operations there has been an influence at work which has not always been recognized, and was possibly this same heat theory. When a heat is made up for the malleable furnace the chemical and physical limits are almost always calculated by the analysis and grading. These figures vary in individual works, but are firmly established in local practices. After the heat is charged the first opportunity for heat treatment is presented, for here the chemical and physical make-up will be altered. Iron in air furnace is capable of resisting, without burning, an amount of heat somewhat in excess of that which prevailed during first casting at blast furnace. The fluidity and heat of the metal will be governed by the average grading of mixture. Most important to be guarded against is overheating the metal—exposing it to the chance for burning. There are several things which warn the watchful of this contingency and when noted are of service. When the charge is high in silicon, and there is difficulty encountered in combining carbon after the metal is hot enough to pour, continued blast cannot but burn the oxide or iron. When the mixture is in this condition, there has been an excess of silicon, and in heats following the grade should be altered to overcome this trouble. Burnt iron is worthless, for the oxide has been past its limit, and when this iron comes through the annealing oven there is no mistaking its history. Burnt iron may also be detected by the brown smoke from ladles showing thus clearly the volatilization of the oxide. The heat of the blast and furnace, in connection with the chemical complexion of the metal, plays the deciding part in casting details, etc.

The action of flame influence upon mixtures for heavy and light work is at once prominent, on account of its being directed toward the accomplishment of the same end, through different channels. In the instance of heavy work, the mixture being low in silicon, and possibly high in combined carbon, the flame from the beginning of heat will be exerting an oxidizing influence driving the small percentage of graphitic carbon into combination, and while the heat is "coming up," will further a higher state of combination. In a light work mixture with high silicon and graphitic carbon the flame, after bringing the iron to the melting point, will have to burn out some of the silicon, before the carbon will enter into combination.

And here more than at any point in furnace heat practice, should the metal be given great attention. Too often will the metal be burnt at this moment, having lost, as it were, some of its factor for defense. A heat should never be exposed to a flame that is beyond the resisting powers of the mixture. In other words, when the furnace is too hot, instead of a natural evolution being formulated in the metal, the silicon and carbon content is simply burnt out by this intense heat, the oxide being impaired at the same moment. This latter action is similar to that in the Bessemer converter; for when heat rises, after the passing of the silicon, the iron thus exposed is quickly scorched.

The action of the flame upon the metalloids has its bearing also upon physical standards. Again taking the mixtures for light and heavy work, it will be found that the physical results are governed greatly by the percentages of certain metalloids in the mixtures. Heats for both classes of work may be made up of the same irons, in different proportions, to meet any specification required. A mixture high in silicon will offer, from the theory of the volatilization of a certain part of its silicon, an opportunity for the flame to "catch" the iron, while a heat lower in silicon repels any other action of the flame, other than that which liquifies the metal. Regarding the strength of these mixtures, the high silicon-carbon cannot develop the tensile figures of the low silicon-carbon because the former will be an open metal, while the latter will be very dense. The lower the percentages of silicon and carbon that may be maintained for all classes of work, the higher will be the tensile strength and elongation. High tensile cannot be obtained from high silicon, for the latter has a disintegrating influence upon the metal in annealing.

Silicon which stands as the exponent of a contained heat factor cannot be overestimated as to its work in facilitating the passage of graphitic carbon; but after the metal has been poured into molds, its presence is deleterious, for it makes possible, by reason of its known heat containing qualities, the renewal of graphitic carbon. A heat for any special class of work should be so calculated and arranged that the silicon figure should not be higher than that which will allow the carbon to turn over, without the holding of metal in contact with flame to accomplish this purpose.

The conversion of the carbon in a malleable furnace should be worked on as nearly a chemical calculation as is possible, coupling theory with practice. Artificial heat will eventually overcome any deficiency in calculation, but a normal evolution is brought about by the iron being carefully adjusted. This is essentially heat condition. All iron from the blast furnace is either gray or white, depending upon the action of hot gases upon the ores for the percentage of carbon present. The blast furnace theory of heat treatment is that the gases of combustion ascending through the furnace leave quantities of their positive elements to combine with the oxygen of the ores, that is carbonic oxide leaves carbon. This carbonic oxide absorbs the oxygen from the ores, and leaves the protoxide; the ore in dropping to the hearth will be composed of metallic iron and foreign matter. If this process is not well performed—and this, of course, is directly consequent upon the degree of heat generated—some oxide of iron will be left in the slags, to be eventually flushed off. Any ore which being thus treated, without its surplus of carbon from the gases, cannot produce anything but white iron. All the carbon for making gray pig metal must be in the ore before it sinks to the hearth. Therefore, with a hot furnace and hot blast we assume a surplus of free carbon in gas mixtures, which carbon, if it is not chemically, is at least mechanically, mixed with the gas, and, being very finely diffused, eventually penetrates into the ore.

The heat and pressure of the blast have almost the controlling influence in the blast furnace, and also the air furnace. The pressure of blast is the one factor which creates a heat condition. In blast furnace practice we find that the carbonic oxide liberated by the fuel unites with the ores, and afterwards enters into the composition of the metal. In air furnace practice we find the same gases liberated under dissimilar circumstances, and acting in a strictly adverse manner. If we thoroughly understood the character of pig metal, we could regulate for various mixtures some approximate pressure of blast required. The regular and constant pressure with which the blast enters the air furnace, no matter what may be

the character of the iron, may account in a measure for many apparent irregularities in furnace operation and quality of metal when cast. For the remelting and refining of pig iron, regarding the pressure of blast, etc., there must be in the air furnace a condition the reverse of that which occurred in the blast furnace during the smelting. For example, if the mixture is made up of gray iron, which was produced under high thermic condition, a soft blast is preferable, because this iron contains a high degree of heat efficiency itself, and with a high pressure the danger of burning is greatly enhanced. If the mixture be composed of white irons originally created under low furnace heat, there will be required to melt them a high pressure blast for the substitution by artificial means, of a quality they do not possess.

Perfect combustion of air in reverberatory furnaces has much to do with the physical character of the metal, and it is of course consequent upon the heat generated in the fire hole. Imperfect firing means volumes of air passing through the furnace unburnt. It was to correct this last defect that the blast was introduced over fire bridge walls. The heat of a combustion flame contains the amount of oxygen necessary to nourish the chemical and mechanical reactions taking place in the furnace. That flame influence in the furnace should be positive is a very important point, for if by any chance the combination of the metalloids is not thoroughly effected, there will be trouble all along the line. Carbon must be in combination at the moment of pouring. If it is not, it will keep the iron porous, and oxygen in the anneal having access to the interior of the castings, will cause a reaction to ensue resembling decomposition. Carbon does not combine at low temperature in the air furnace, and the heat of the blast must be carefully regulated after the combination has been made. In the heat for heavy work, when the iron will average a No. 5, with its small percentage of silicon already oxidized, the carbon being also in combination, the blast will have to raise by its means an artificial heat condition. If the metal in the air furnace were kept exposed to the flame long enough, the high temperature would eventually cause the combustion of carbon and steel would be the result. When pig iron is deprived of its carbon, its cohesion and ductility are increased, but if the amount of silicon is disproportionate to that of carbon the iron is beyond improvement, and to offset this latter contingency, the addition of re-carburetting metal is made to steel before leaving the furnace.

The flame treatment should be given all care, in order to overcome, to the extent possible, furnace losses. Much depends upon the quality of iron composing the charge, and this in turn depends upon blast furnace operation. Good soft gray iron or white iron generally furnishes metal of unfailing quality. Charcoal iron has always, on account of the absence of foreign matter, yielded more iron, ton per ton, than coke metal, the furnace loss with the latter often reaching 15 per cent. of the entire charge. It is a serious problem to suggest any method to prevent this great loss of metal. The general consideration of heat treatment and conditions will, it is believed, be of great service to the metallurgist, for it will acquaint him more intimately with the latent capabilities in the metal, and thus, coupled, with analyses, will give him the history of the iron beginning at the blast furnace.—"Furnaceman" in Iron Trade Review.

Notes from Various Sources.

The Maywood Foundry & Machine Co., of Maywood, Ill., has issued a pamphlet describing the Maywood Molding Machines. Examples of the class of castings now being made on these machines are shown, together with useful information as to the possibilities of machine molding.

* * * *

A second edition of the lecture by Walter B. Snow, on "Mechanical Ventilation and Heating By a Forced Circulation of Warm Air," has just been issued by the B. F. Sturtevant Co., Boston, Mass., by whom it will be mailed on application.

* * * *

Wesley Meeteer, for some time purchasing agent of the Jackson & Sharp Company, Wilmington, Del., has resigned to become vice-president and general manager of the American Machinery & Export Co., which was recently icnorporated under the laws of New Jersey, with a capital of $250,000, and has opened an office at 15 Cortlandt street, New York City. The company will deal in all kinds of machinery, principally for export, and will make a specialty of buying for foreign railroads.